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THE KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY.

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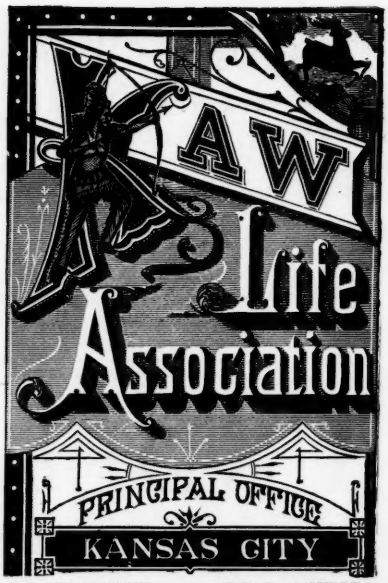

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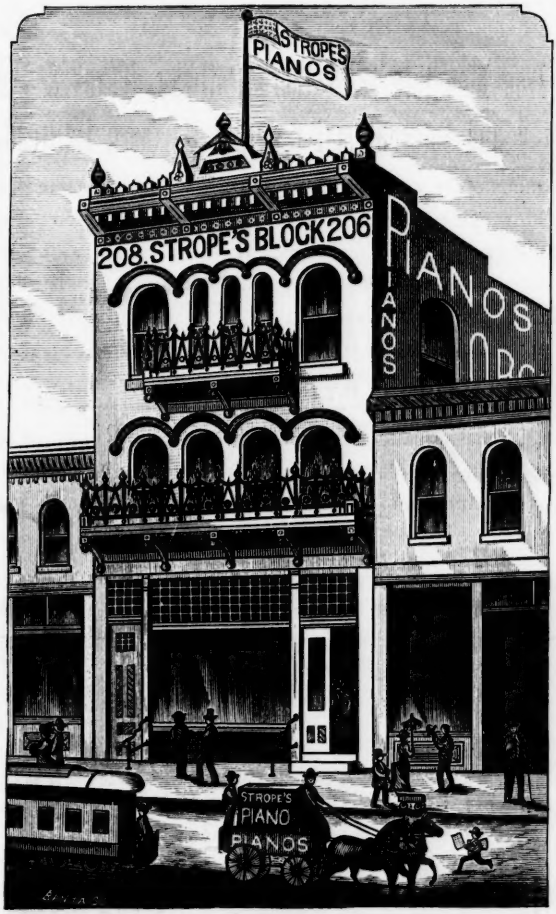

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REVIEW OF SCIENCE AND INDUSTRY,

A MONTHLY RECORD OF PROGRESS IN

SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. VII. MARCH, 1884. NO. 11.

ARCHÆOLOGY.

PRE-HISTORIC YANKEES.[1]

WARREN WATSON, KANSAS CITY, MO.

When the white man first set foot on the American shores, he found evidences that civilization had not been confined to the old world. Not only was he confronted by existing phases of native culture which justly aroused surprise, curiosity and admiration, but he was also shown the hoary monuments of races, who in a remote and forgotten antiquity, had flourished for a period, rose to an elevated pitch of power, culture and prosperity, then disappeared so completely that nothing remained to testify of their existence, or their history, save the dumb relics of their art and industry and the unintelligible voice of tradition. Among these ancient races, none have excited more attention, or more controversy, than the people we have been accustomed to call the Mound-builders.

Upon examining a map of North America, it will be observed that the great central basin, known as the Mississippi Valley, is penetrated from the northwest by innumerable streams, which, gradually mingling their currents, form at length the mighty flood which bends its course beside this prosperous city. Near the sources of the most northern of these confluents of the Missouri are the fountains of three other fluvial systems which pour their various streams into the Arctic, the Pacific and the Atlantic Oceans. Of these the least important to our theme are the streams which flow northward to Great Slave Lake and empty, through

1. Read before the Kansas City Academy of Science, February 29, 1884.

the Mackenzie, into the Arctic Ocean. Between the headwaters of these tributaries of the Mackenzie and the sources of the Missouri, is interposed a network of streams that flow eastward into Lake Winnipeg and the Red River of the North, and, distributed from thence into the great lakes and Hudson's Bay, find their way into the Atlantic. Of these streams the most considerable is the Saskatchewan, the northern branch of which rises a little to the north of Athabasca Pass, at about the 53d parallel, and, uniting with the southern fork, flows into Lake Winnipeg. On the western side of the mountains the rivers which seem pertinent to the subject are the Columbia and Frazer's Rivers; the former of which draws tribute through its northern and southern branches throughout a region extending from the 40th to the 52d parallel—from Athabasca Pass on the the north to Fremont's Peak on the south. Gathering from this immense scope of mountain and plain a mighty flood, this river rolls its united waters westward and enters the Pacific about 120 miles south of Vancouver's Island. Frazer's River rises within Athabasca Pass and, flowing first northeast then southwest, empties in the gulf that separates Vancouver's Island from the mainland. Between the Columbia and Frazer's River, formed by them into a peninsula of wonderful beauty and fertility, guarded on the west by the sea and on the east by the escarpments of the Rocky Mountains, lies a region which was probably one of the earliest homes if not the cradle land of the Mound-builders. The mountain barrier which forms the eastern limit of this mesopotamian country is traversed by several passes, among which are those of Athabasca and Kananaski. Of these, the former is accessible by way of both the rivers named—one even rising within its gorge—and the latter is contiguous to the northern sources of the Columbia. Thus it would naturally result from traversing these rivers to their fountain-heads, that the passes referred to would be discovered; and they certainly would be utilized if the wandering instinct should tempt the discoverers to a passage of the mountains. Between the northern and southern branches of the Columbia, the country is, for the most part, rugged and uninviting; full of difficulties for the traveller, yet presenting, now and then, spots of singular loveliness and fertility. In the region thus described portions of British Columbia, Oregon and Idaho and all of Washington Territory are comprised—a theatre more extensive and more varied in character than ancient Egypt, Chaldæa, Greece or India.

In the northern part of this region, on Vancouver's Island and the neighboring mainland, remains exist in considerable profusion, which have been declared identical with mounds and earthworks found in the Mississippi basin. Indeed, if the newspapers can be trusted, it is in this vicinity that the mound-builders left their most stupenduous work—a mound 300 feet high and 900 feet square at the base. I know that the exploration of this region has not been either thorough or very intelligent, yet no candid student can reject the evidence at hand, which needs only be credited to establish the presence at this point on the Pacific coast of characteristic remains of the Mound-builders. Northward, however, of this locality, passing travellers have noticed analogous remains extending

even to the boreal latitudes drained by the Yukon and the littoral parts of western Alaska.

From Vancouver's Island, spreading eastward to the mountains and converging along the rivers toward the most accessible passes, the Mound-builders debouched from the mountains into the great central basin at various points, designated by their relics, from the 50th to the 53d parallel. Of this horde there seems to have been two streams; one pursuing to its mouth the Saskatchewan River, passing southward along Lake Winnipeg to the Red River of the North and ascending that stream into the present Minnesota and Dakota; the other descending the sources of the Missouri and converging its scattered detachments npon that mighty flood. It is quite possible that this stream of migration divided at the foot of the mountains and that a portion followed south the chains and spurs of the Rocky Mountains as the others followed the streams. The monuments of this mountain people, changing with their changed habitat, have been traced through Montana, Colorado, Idaho, Utah, Arizona, the Mexican State of Chihuahua and onward to the great table-land, the tierra templada, of Mexico.

Following the course of the Missouri and leaving remains in every fertile and well-watered region contiguous to its course, the Mound-builders paused at nearly every point where modern commerce has established its depots, and left profuse monuments to testify of their sagacity. From Omaha to St. Louis an almost unbroken line of mounds follows the river and, where the Mound City is now seated and stretches forth the arms of commerce into all parts of the continent, the Mound-builder established one of the centres of his empire.

In the meanwhile, the detachments which had crossed to the Red River pursued their eastward course no farther. In Canada no traces of the Mound-builders exist. Turning their faces southward they passed the boundaries of the present United States, advanced around the great lakes as far as New York and descended the Mississippi until they met, as foemen or as friends, the ancient citizens of St. Louis. From thence they occupied every tributary of the Father of waters. On the Illinois, the Ohio, the Tennessee, the Arkansas, their monuments challenge wonder and admiration; nor did their wanderings cease till they had penetrated east and south as far as the Alleghany Mountains and the Mexican Gulf, crossed the Rio Grande into Mexico and even reached through the inviting savannahs of Georgia and Florida, the shores of the Atlantic Ocean.

It is now proper to describe in a rapid way the antiquities from whose testimony the foregoing itinerary has been deduced. But it should be premised that mounds and earthworks are not peculiar to this continent. All over the world, among the relics of pre-historic times, fortifications, dykes, tumuli and cairns form conspicuous elements. In the British Isles the smaller mounds are common features of the landscape. From the shores of the Atlantic to the Ural Mountains they have been found in great abundance, and in Asia they are scattered over the great steppes from the Russian frontier to the Pacific Ocean as far North as Behring's Strait and from Siberia to India. Even in Africa they are not wanting. Most of these are small in size, but among many similar works

may be mentioned Silbury Hill in England, an artificial mound 175 feet high. While the great majority of these old world relics are of unquestionable pre-historic origin, there are many which have been reared within the historic period. Of these the most conspicuous examples are the tumuli of Queen Thyra and King Gorm, in Denmark; the Kouloba tumulus in the Crimea and the cairn raised to the memory of the Prince-consort, Albert, to which each member of the English royal family contributed a stone. If we turn to reminiscences of the past, contained in ancient literature, we find that Semiramis buried her husband King Ninus under a great mound of earth; that over the grave of his friend Patroclus, Achilles heaped a mound upwards of a hundred feet in diameter; that the tomb of Alyattes, King of Lydia, was a tumulus of stone and earth nearly a mile in circuit; that Alexander the Great caused a mound to be heaped over the grave of his friend Hephæstian at a cost of nearly one million dollars; and that according to the earliest historians mound-burial was practiced by the Scythians, Etruscans, Greeks, Germans, and many other nations. Nor are fortifications, or embankments, less abundant. Sometimes these are long ramparts like that which stretches from Bristol Channel to the Dee; sometimes they are isolated fortresses like those in the Scottish highlands and elsewhere. These are almost identical with American works of the same character.

Throughout the broad extent of territory over which the Mound-builders wandered, but chiefly on the river courses that form the Mississippi system, their remains are found in great profusion, and may be placed in the following categories:

I. Mounds. These are various in character and have been classed as temple, altar, burial, observatory and residence mounds. But besides those which can be identified as belonging to either of these classes there are many whose status is not at all obvious. Some of these are conjectured to have served as garden beds; but these, as well as the so-called residence tumuli, are more properly described as terraces than as mounds. The temple mounds are of various forms, rectangular, octagonal, oval, conical, etc., and their truncated tops, usually spacious and at a commanding elevation, suggest the teocallis and huacas of Mexico, Central America and Peru, and have given them their supposed religious character. Like these southern structures they are ascended by graded ways or terraced steps or spiral paths. Mounds of this class are rare in the northern habitat of their builders; but at Cahokia in Illinois, in various parts of Missouri, Ohio, and Indiana, and in almost every southern State west of the Alleghanies, from Virginia to Texas, these relics of antique devotion are abundant and worthy of attention. The great mound at Cahokia covers a space of eight acres, is ninety feet in height and the platform on the summit is nearly two acres in extent. Around this mound an immense number of smaller tumuli are scattered, presenting a scene similar to that viewed by Cortez from the summit of the pyramid of Cholula. While this class of mounds occur but rarely in higher latitudes of the Mound-builder's territory, they grow more numerous and remarkable toward the south; seeming to insist in unmistakable language that progress

in religion and industrial art accompanied by a well organized but despotic government was leading the race to a high stage of civilization. The most lofty of these mounds, the pyramid of Kolee Mokee is an antiquity of Georgia; it is ninety-five feet in height and 1128 feet in circuit. It is a parallelogram 350 by 214 feet, and the plane on the summit measures 181 by eighty-two and a half feet. On the Lower Mississippi these tumuli assume a more finished form and structure. Here we meet with the use of adobes, or sun-dried bricks, in their construction, and, in one or two instances, stone is reported to have been used as a material. There is little doubt that on the lofty summits of these mounds, either in a wooden oratory or under the over-arching sky, the priests performed the imposing ceremonials of a highly developed religion while the whole community watched the mysterious rites with unquestioning devotion. Taking a general view of the entire region traversed by the mound-builders, and ignoring the mound reported from Washington Territory, the temple mounds have not been found further north than the great lakes, further east than Virginia or westward of the Arkansas Valley; while they are distributed profusely throughout the Gulf States near navigable streams and especially along the Mississippi River.

The barrows which have received the name of altar or sacrificial mounds are usually symmetrical cones with rounded summits. In the construction of these mounds their builders followed a method which has attracted much curiosity as to its signification. Beneath the apex, either on a level with the surrounding surface or raised a little above it, altars or hearths of baked clay are invariably found, and over this the mound is heaped in concentric layers of material, usually of soil, gravel, clay and sand. This hearth evidently possessed a sacred importance, and to protect it from desecration, the superimposed tumulus was formed in successive strata and of substances of such a nature that the least disturbance of its surface would become apparent at once. It is my opinion that to these altars the sacred fire had imparted a character which excited superstitious veneration. When they had served their purpose, perhaps at the command of the priests, the protecting mound was heaped above them in as many layers as the caprice, or the wealth, of the owner dictated. In some cases, particularly in Iowa and in Clay County, Missouri, these mounds have been found with stone structures in the interior, whose use is entirely problematical. Human remains are not found in mounds of this character except in cases where the modern red Indian has interred his dead in them and left the broken strata to tell the story of the desecration.

The burial mounds, as the name indicates, were places of sepulture; these were probably used as burial places for the rich and the eminent and occasionally reach very imposing dimensions. Mounds of this class are of all sizes and are generally conical in form. Sometimes even the temple mounds were used to bury individuals of more than ordinary influence or sanctity. The mode of burial was extremely variant; sometimes the body was placed in a sitting posture, sometimes prone upon the face, and again on the back or side. Near by were spread the burial offerings, the amulets and the food which primitive and savage

man all over the world left at the grave of his dead. This custom is not a mark of savagery however; Sophocles introduced in the tragedy of Electra the ceremony of placing food upon the grave of the murdered Agamemnon, and the Chinese, Egyptians and Assyrians invariably supplied their dead with abundant food and drink for their journey to the spirit land. It is noticeable that while certain customs of the Mound-builders were never departed from in their long journey, the mode of observance was varied in many ways. For instance in British Columbia a piece of quartz is frequently found among the funereal relics; in some instances this is replaced by a piece of coal, and this again, during their later pilgrimage, by a piece of mica quarried in the Alleghany Mountains. It was also usual to deposit with the dead manufactured articles; and it is likely that this custom arose from the world-wide superstition against the use of property which belonged to a dead person—the natural result of which would be to place them in his grave that he might use them in the spirit world. While the burial mounds contain by far the most of the surviving relics of their builders, yet all the tumuli, except those designated as altar or sacrificial, have yielded along with archæological treasures, the mouldering bones of this ancient race. It may as well be stated here that mound burial was more common in northern latitudes than under the southern cross. In the course of the centuries that must have passed between the time of their exodus from British Columbia, and the time the lower Mississippi was reached, there was sufficient space for the rise of new forms of burial. Among these may be noted cave-burial, urn-burial, burial in stone graves and in sepulchres formed partly by nature, partly by artificial means, in the face of cliffs and exposed rocky strata. Sometimes there are found trenches and pits filled with human bones; these are perhaps the depositories where the common herd of what must have been a dense population received scant honors of sepulture. Occasionally masses of bones are found under terraces of earth, or stone, which probably are of similar origin. On Vancouver's Island the dead were usually buried in a basin-shaped hole and covered with a slab before the mound was heaped above them; and mounds in Wisconsin have been found where the body was deposited in similar excavations. It is probable that an examination of the vast unexplored regions extending from the Red River to the mountains will show this mode of burial to have been commonly practiced.

The observatory mounds were simply signal stations; and systems of them have been traced, so sagaciously arranged that communications between communities, hundreds of miles apart, could be passed along as rapidly as a modern telegram.

The mounds which are supposed to have been used to erect dwellings upon, differ somewhat in form from the others. Usually they are small platforms of earth elevated from two to fifty feet above the surface and of varying dimensions; one of these constitutes a terrace of the great Cahokia mound and communicates with it by a graded way. Among other indeterminate forms are the animal mounds of Wisconsin, Ohio, Missouri and the Arkansas Valley. Some of these

are noteworthy for their size, some for the shapes which they assume. Among these the most remarkable are the serpent and turtle mounds of Ohio, and the elephant mound of Wisconsin. The serpent mound is more properly an embankment, over seven hundred feet long, extending in sinuous curves along the summit of a ridge; ending at one extremity in a triple coil, and at the other in the head and open jaws of a snake. Within the jaws is an oval mound of no insignificant proportions itself; and it has been thought by some archæologists that the oriental symbol of a serpent swallowing an egg was intended by its builders. Its head, however, with the accompanying mound, is suggestive of the Egyptian tau, or cross, with its oval loop, as the neck of the snake is intersected just behind the head by a bar, which is certainly no natural complement of the animal. The mound referred to as representing the form of an elephant leaves a strong suggestion in the mind, that this mysterious people either knew familiarly the now extinct mastodon or else brought from some other land a memory of the elephant; especially as its testimony is supplemented by a pipe in the same shape from an Iowa mound. These so-called animal mounds are in fact immense bas-reliefs of men, beasts, birds and reptiles. Cruciform mounds are also found, some pointing with great exactness to the cardinal points.

II. Embankments or ramparts. These may be distinguished as either defensive or religious, though many possess no obvious significance. Those of a military character manifest a respectable progress in the art of war. In some instances the intrenchments surround extensive areas and, occasionally, they are carried—like the Chinese wall and Offa's Dyke in Great Britain—over long stretches of country and connect the monuments of widely separated communities. Usually, however, these works seem to have formed citadels of refuge, easy of access and secure from assault when the wild people of the woods took the war-path. Sometimes a precipitous hill was chosen as the nucleus of the fortress; sometimes an ocean headland, or a peninsula whose steep and rocky sides projected into a stream, was selected as a position to be easily fortified and defended; sometimes contiguous streams were connected by canals and the strong position thus created further strengthened by embankments and stone walls. The approaches to many of these fortifications are protected by defenses that show no mean ability in the practice of the military art. In one case the approach to an aboriginal fort is along a covered road with embankments on each side thirty feet in height. Very frequently these defensive works are connected with remains of some or all of the other classes described; and they are the most widely distributed and the most homogeneous in character of all these remains. Indeed, plans drawn from earthworks in the Mississippi basin bear so strong a resemblance to those in British Columbia and even to those left by the Pueblo or Cliff Indians of the Rocky Mountains that they have served to delineate the features of these works with very slight alterations.

The enclosures presumed to be of a religious nature, are well calculated to arouse curiosity. They are usually combinations of geometrical figures, in which perfect squares and circles predominate. It is obvious from this fact that the

Mound-builders had advanced at least as far as the ancient Egyptians in mathematical skill; any modern surveyor can appreciate what difficulty there would be in drawing a perfect circle which should enclose an area of ten or twenty acres. In some instances circles and squares enter into various combinations and these are repeated in separate localities with such exactness that there remains no doubt of their possessing a well-defined meaning if we could but discover it. Some of the most remarkable of these earthworks are in the vicinity of Cincinnati.

III. Mines and excavations. Numerous traces have been left by the Mound-builders in the mining regions of Lake Superior. As an instance of their temerity in mining operations, it may be mentioned that, at one place, a piece of pure copper, weighing over five tons, was found fifteen feet below the surface beneath trees at least four hundred years old. After having been elevated a distance of several feet from its original bed, by means of skids, the attempt to raise it seems to have been abandoned. The mass of mineral bore marks of fire, and stone tools were scattered about. So sagacious were these ancient miners in locating their mines that modern prospectors feel certain of a rich find whenever the traces of their work are discovered. In working these mines, sledge-hammers of stone were used weighing from thirty to forty pounds and wielded by means of a handle of twisted withes. Wooden shovels were also used; specimens having been preserved by the antiseptic action of copper-salts. While the Mound-builders seem to have been unacquainted with the value of the immense deposits of iron-ore within their reach, they were perhaps the only people who made use of iron, in any form, at the stage of progress reached by them. Iron pyrites was mined by them and worked up into mirrors and other ornaments. They also quarried extensively to procure various kinds of rock as materials from which to fashion their pipes, weapons and utensils. At Golden Grove, in Barton County, Missouri, there are remains of ancient excavations, which have always been a riddle to the inhabitants. It is thought by some that they are remains of De Soto's gold-hunting expeditions; and in that belief no insignificant sum has been sunk in attempting to find treasure. All of the shafts opened were stopped by a strata of hard porphyritic rock, which, in my opinion, was the real object sought by those who made the excavations—the Mound-builders. This view is strengthened by the fact that porphyry has been found in mounds removed hundreds of miles from localities where this rock is found. The mound-builders also mined galena, though not to any considerable extent. It is but seldom found in the mounds. In North Carolina are ancient quarries from whence they drew the mica which formed so important an element in their funeral offerings throughout the Mississippi Valley.

IV. Arts and manufactures. It is hardly necessary to enter into a minute description of the specimens of arms, utensils and ornaments exhumed from the mounds. They have been familiar to all residents of the Mississippi Valley since childhood. At any rate, I shall pass over all such common and well-known relics as arrow-heads, stone knives, hatchets and hammers, and in fact, all ob-

jects which are not peculiar, alone, to the Mound builders. For it must be known that the ingenuity of man, in arriving at the earliest inventions, pursued the same course, and reached the same goal amongst every race on the face of the earth. Just as art, up to a certain stage, passes through identical forms and is expressed through similar artifices wherever the artistic impulse is generated, so invention, in its primitive stages, was forced to proceed in the same way to reach the same conclusion—the manufacture of the most necessary implements and utensils from the commonest or most easily managed materials.

The relics of mound-builder art and industry include articles of metal, stone, earthen-ware, horn, bone and shell. Besides articles which are known to have been useful, or ornamental, there are many objects whose use is not at all obvious. It was thought for a long time that the Mound-builders were ignorant of the arts of casting, welding and alloying metal; but a careful and intelligent scrutiny of their metallic relics has shown that they were at least acquainted with a method of casting. While large numbers of implements and weapons have been found fashioned from copper, the most common use to which this metal and others was put, was in the manufacture of ornaments, such as rings, gorgets, medals, bracelets, beads and many other problematical articles—some of which it is conjectured were used as money. As gentlemen nowadays wear on their watch-guards, or fobs, miniature utensils, weapons, etc., so the Mound-builder bore on his person small models of objects of utility, or defense, either as ornaments, or as badges of his avocation. Several mounds have been opened which produced amulets so cunningly wrapped in silver that the work could scarcely be distinguished from plating. In southern localities, the mounds have produced gold beads and other curious articles in the same metal, which by some are thought to be coins.

The pottery of the Mound-builders was a production of superior mechanical and artistic type. Specimens can be collected which may not be distinguished from the work of primitive Egyptian, Mesopotamian or even Greek artists. The material is usually a pure clay, containing in some instances a slight admixture of pulverized quartz, or colored flakes of mica, though a black earth was occasionally used, evidently of artificial composition. Notwithstanding the great regularity of form and the beauty of finish of their pottery, there are no traces of the use of the potter's-wheel; and glazing, or vitrification, was rarely attempted. The decorations on pottery include animal forms, arabesques, geometrical figures, and in a few cases, the human form and features. These decorations were usually incised with sharp instruments. Besides weapons and knives, pipes are the most abundant of the articles exhumed from the mounds; and it is upon these objects that the Mound-builder expended his highest art. Instead of the rude monstrosities which delight the savage artist, the delineations upon these pipes represent, with accuracy and taste, objects in the various kingdoms of nature. Among forms truthfully drawn may be mentioned the elephant pipe of Iowa, and others which represent animals and birds unknown to the temperate zone. The material of these pipes is usually a hard red porphyry.

Specimens of mound-builder cloth have been found in several instances, strangely preserved from the most remote antiquity, through the effect of antiseptic substances, or, from being charred by fire. This cloth was woven of both animal and vegetable fibre; was coarse in texture, but composed of threads uniform in size, and regularly spun. While the process of weaving seems to have been usually of the simplest description, there are instances of the manufacture of a kind of cloth so knotted at the intersection of warp and woof as to prevent either from being drawn.

Besides the relics enumerated, a few statuettes and figures of animals have been found, which may have served as idols; though there is nothing to show but what they were simply outgrowths of an esthetic feeling common to humanity. A few sculptured and incised tablets have been exhumed, which represent scenes of mound-builder life, and give us a dim perception of their characteristic habits. One of these, known as the Davenport tablet, depicts a circle of persons dancing, or standing, around a mound upon which a fire is burning; while on the ground near by several human forms recline to await either sacrifice or burial. This sketch is rudely scratched upon a piece of slate on the other side of which are a number of characters, which, by some, are thought to form a calendar. Above the scene described, the arch of the sky is represented with sun, moon and stars, and above this again, are numerous characters which bear evdence of being an inscription,—indeed there is no doubt but that they convey a meaning in connectioo with the scene depicted below, which would unravel some antiquarian mysteries if we could but decipher them. Another object of the same sort is figured by Mr. Conant, in the "Commonwealth of Missouri." This is an incised shell which was found in a mound near New Madrid, and depicts the war-like adventures of some prehistoric hero. It is a valuable relic for the information it conveys as to mound-builder costume and arms, as well as some notion of the stage of advancment reached by this race in representing not alone the human figure in a state of rest, but also, when moved by passion or emotion. There is a most remarkable resemblance between this relic and similar specimens of native art discovered in Mexico, Central America and Peru.

Having thus rapidly surveyed the archæological aspect of the subject, it remains to present what we have learned of this people by an examination of their monuments. One fact is impressed upon us at once; and that is that they were a numerous and strongly governed people.

If their communities had not been extremely populous, it would have been impossible to furnish the labor for constructing the immense works which have excited so mnch attention from antiquarians; and unless they were controlled by despotic power it would have been impossible to utilize the labor for this purpose. That they were one race from Vancouver's Island to Texas and Florida is proved by their relics, and by the mouldering remains of the people themselves. They possessed physiological characteristics which not only distinguish them from the modern red man, but also from nearly every modern people. One of the most striking of these characteristics is the low retreating forehead, and the

the flattened tibia. Their institutions, while they may have received many modifications and developments, during the transit from north to south, were practically homogeneous in all parts of their habitat. They were agriculturists, miners, artisans. They cultivated maize and tobacco; and it is a curious fact that both of these plants are by some savants thought to have originated in Asia. There is no doubt but that the cultivation of the former passed at a very ancient period from the southern Asiatic islands, into China, where it has since been found, in remote districts, in a wild state. Tobacco has also been found growing wild in China. The mound-builders cultivated other products of the soil; among them a fibrous plant allied to hemp or flax, from which their cloth was woven. They manifested a considerable advance in the art of war, especially in the defense of fortified places. Their skill in the manufacture of pottery and in stone- and bone-carving was not at all contemptible, and the mathematical knowledge displayed in the construction of earth works, geometrically perfect in form, shows that they had advanced far above the condition reached by any Indian race known to the white man within the boundaries of the United States. Of the extent of their commerce it may be said that side by side, in the same mound have been found objects in copper and silver from Michigan, mica from the Alleghanies, obsidian from Mexico, and shells from the Gulf of Mexico.

Of their architecture we can have no exact knowledge. There is little doubt, however, that the temple-mounds were surmounted by sacred edifices, constructed of perishable materials, which, in order to conform to the magnitude of their sites, must have made some pretensions to architectural beauty and grandeur. The richly ornamented edifices of southern Mexico and Central America, especially those at Uxmal, are considered by competent authorities to have originated from wooden models. It is obvious that even a wooden structure, decorated and finished with the care and skill bestowed upon Central American temples and palaces would present no mean appearance. A powerful priesthood and a wide-spread religious system are implied by the monuments. We are ignorant of their religious rites, though it is indubitable that the cult was a worship of the Sun, and that human sacrifices was an accompaniment of their ceremonies. It is quite probable that their government was a theocracy or a partial theocracy—the priesthood being the governing caste. The construction of the stupendous works described could best be explained by a supposition that a large portion of the people lived in a servile condition. The mining exploits of the Mound-builders have been sufficiently referred to and the mounds are eloquent with mechanical skill and industry.

When the passage of the Mound-builders was stopped by the southern seaboard, what then? Were they slaughtered by pursuing enemies, or driven into the waves, or exterminated by pestilence, or overwhelmed by some tremendous cataclysm? They were a race of navigators. Their journeys were almost invariably pursued along the courses of navigable streams; and it is only natural to suppose that these journeys were really voyages by water. Why then should the waves of the Gulf affright them? With canoes no larger than many used by the

modern red men it is possible to coast the shores of the Mexican Gulf and the Carribean Sea. Such a canoe was seen by Columbus off the coast of Yucatan, bound on a trading voyage, and having on board a cargo of aboriginal merchandise. Whether or not the Mound-builders now became navigators and sent colonies around from the mouth of the Mississippi to the sea-board of South America, and peopled regions where the spaniards found so much to admire and destroy, it is certain that Mexico could have been, and was, entered through Texas. For here and there amongst palaces and temples once the abode of Aztec culture and devotion, now ruined and desolate, a constant feature intrudes itself; here are the unmistakable shrines of the Mound-builders' religion and the characteristic graves of their dead.

The most remarkable monument of pre-Aztec culture in Mexico, the great pyramid of Cholula, reminds us of the temple-mounds of the north. In fact one of the most prominent features of American ruins, is the ever present pyramid. In Mexico and Central America they are common objects of the landscape, and the bewildering ruins of Gran Chimu in northern Peru, are remarkable for the number of pyramidal structures scattered about. It may not be out of place to introduce here a few remarks as to the significance of these structures and their place in the discussion of anthropological questions. It is a trite saying that art is, up to a certain point of development almost identical in expression the world over. Upon this fact, which is not at all wonderful, the most extraordinary theories have been based as to the origin and development of American civilization. Thus it is said that the presence of pyramids in America attests an old-world origin for their builders; because there are pyramids in Egypt. But this architectural feature of primitive culture has been of universal use as an expression of devotion or as a memorial of some person or event. Pyramids have been found in Chaldea, India, China, Mexico, Central America, South America as well as Egypt. Genghis Khan is said to have reared a pyramid of human skulls to commemorate his victories; the pile heaped above Porsenna, "o'ertopped old Pelion" and "made Ossa like a wart"; Jacob and Laban heaped stones together to keep their treaty in remembrance. All over the world cairns, or heaps of stones, and artificial mounds of earth, show, in its most primitive condition, a structural form which might easily develope into such marvelous monuments of power and industry as the pyramids of Cheops and Cholula—the most stupendous creations of human skill and industry extant. Indeed we have found the simple tumuli, like that of Cahokia, gradually assuming the pyramidal structure, in the southward progress of the Mound-builders, until it culminated at length in the edifices of Mississippi, Arkansas and Texas, in which adobe blocks, or even stone, were used as materials.

As the pyramid of Cholula is so nearly related to the northern temple-mounds, and is so evidently a development from them, I will close this paper by briefly describing it. It derives its name from the pueblo near which it is situated; the ancient Aztec and pre-Aztec city so celebrated for its culture and devotion. The pyramid is now covered with trees and shrubs and its terraces are in ruins, but

when the bloody wave of Spanish conquest swept up its spacious stairway, it was in perfect repair and bore on its summit a magnificent temple. The worthy descendants of the Goths and Vandals who followed the adventurous Cortez did not hesitate to apply the lever and torch to this shrine of native piety with destructive effect; yet the eminent Humboldt was enabled in 1803 to still discover the original form and dimensions of the great pyramid. Rising from a base about 1440 feet square, carefully oriented, the structure was carried in four equal terraces to a height of nearly two hundred feet, and a platform nearly two hundred feet square occupied its summit. The ground covered by its base was nearly forty-eight acres in extent, while the pyramid of Cheops covers but little over thirteen acres; the latter, however, is more than twice the height of its American rival. Unlike the pyramids of Egypt, but like the one at Ninevah called the temple of Belus, the Cholulan edifice was constructed of adobes or sun-dried bricks. These are about fifteen inches long and are laid in regular courses with layers of clay between and the pyramid was faced with a cement composed of sand and lime which is now, wherever perceptible, as hard as stone.

Like the temple mounds of the north, this structure was used for sepulchral as well as devotional purposes; the persons interred therein having been, in all probability, priests or grandees.

The chroniclers of the Spanish conquest are full of ejaculatory expressions of admiration at the beauty and grandeur of the temple which surmounted the mound of Cholula. Strangely enough, however, they failed to describe a single feature of the edifice, and we can only take our enthusiasm over it at second-hand. On the spot where this temple once stood, and where the holy fire sent up its wreaths of smoke by day, and gleamed undying through the night, a chapel has been erected in honor of the Virgin Mary. And its bell now summons to worship at the shrine of the Fair God and his immaculate mother, the descendants of those who of old invoked with prayers and chants, and propitiated with sacrifices of sweet flowers, the wise, the beneficient, the adorable Saviour of men, Quetzalcohuatl.

NOTES FROM THE CRADLE OF OUR CIVILIZATION.

PROF. O. T. MASON, WASHINGTON, D. C.

How different has the study of history become since we were children. Nothing was more irksome to us than the memorizing of names and dates, and the records of events that seemed to have no connection. The bookmakers, even then, had the good sense to gratify our love of the marvelous by saving the myths and dreadful stories which had come to them. Of course, it was the Germans who began first to study history critically, and to take away our dear old myths until the narrative was reduced to bare bones, sure enough. We were worse off than before,—this was the age of demolition. A new era has dawned

upon us, all things are caused, "nothing walks with aimless feet." The dear old myths have come back, and with them troops of things, not as sober fact, however, but as the ruins of fact. What stone implements and old ruins are to the archæologist, so are old wives' fables and folk customs to history. How delightful, in this age of love for

> "Old wine to drink, old books to read,
> Old wood to burn, old friends to heed,"

to find that in the earnest desire for old things the search for the origin and relationship of old ideas and customs is not neglected.

In no part of the world are there so many interesting relics of antique thoughts and customs as in Hindostan, and the British have not been backward in noticing the fact. From the days of Sir William Jones to the present moment, there has been an unabated interest in the light which the every day speech and fashion of India could throw upon much that is obscure in our own civilization. There are now published in Madras, Bombay, and Calcutta journals of great value, and another has just been started in Allabahad, in the Panjab, which will be devoted to the systematic collection of authentic notes and scraps of information regarding the country and people.

Now, the proper spirit in which to approach such a study is not that which most people indulge in matters of this kind. No doubt, a Thibetan working his *mani*, or praying machine all day long, keeping it going with one hand while he does his work with the other, is an object of derision to all thoughtless people. To the student who knows that the web of human history is continuous, such things become of absorbing interest.

The Rámáyana is the ancient Sanscrit epic in which are recorded the lives of Rama and his wife Sita. Bal Mik Rishi, better known as Válmíki, who wrote the Rámáyana, was a great hunter before he turned his thoughts to religious matters. Holy men preached to him and then he felt himself to be a great sinner. The holy men studied hard to invent a penance in proportion to his former sins. Said they: The most appropriate penance would be to make him repeat the words *Ram, Ram*, but that would never do, so holy a name as that would not come out of the mouth of such a sinful man. We have it: he shall say *Mra, Mra*, which really comes to be *Ram, Ram*, if you say it fast enough. So the holy men told Válmíki to keep on saying *Mra, Mra*, until his sins were all gone. They went on their way, and did not think of Válmíki for several years. After this long period the holy men passed that way again, and being tired with the journey they sat down on a huge ant-hill to rest. When they were very quiet, they noticed a strange buzzing inside the ant-hill. They all laid their ears to the ground at once, and heard faintly issuing from the centre of the hill, *Mra, Mra; Mra, Mra.* The holy men simultaneously straightened themselves up, and coming to their senses, exclaimed in a breath "it is the sinful hunter to whom, years ago, we gave these words as a penance." They lost no time in digging Válmíki out of the ant-hill, and taking him into their company, saw him become

a very holy man. There may be no truth in this story, but it is a matter of extreme pleasure to know that all round the world great spiritual blessings are believed to be the outcome of an indefatigable spirit.

The folk-lore and questions of the Panjab cast much light on our own manners. When a Hindú Panjábí brings home his bride, his sister must stand in the doorway and endeavor to prevent the entrance of the couple, until they pay her something. The sister does not own the house, has no claim to it, indeed. According to Hindú custom she has probably been for years betrothed to some one else. It is doubtless a survival of those good old days when a man could not carry off a wife without paying a good round sum.

In the Delhi district they have a punishment for a man who is lewd, that consists in putting him on a donkey and riding him round the village. Now the ancient punishment for the same offence was to blacken the culprit's face, put a string of old shoes around his neck, set him on the donkey with his face toward the tail, and thus to ride him round the village.

In the Munee hills there is a *larva* of a beetle which comes out after a rain and emits light, in fact, is a glow-worm. The natives say that, in a former life, a fakir refused to give fire to Behmáta, the goddess who is present at the birth of children, when she demanded it of him. For this act of disobedience he is condemned to carry a light about with him forever.

Some of the lucky and unlucky signs are very interesting: Friday is an unlucky day in the Panjab. If a hunter kills the first game he sees on Friday, he will have good sport. If you are unlucky at any time change your shoes on your feet right and left. A house with the front narrower than the back is lucky, one with the front wider is unlucky. While a house is building, a lamp should be kept alight at night to drive away evil spirits, and an iron-vessel (*nazar watú*) hung up to avert evil eye. The number of steps in a staircase should be uneven, and you should always begin to go upstairs with the left foot on the bottom step.

As a protection against evil eye it is necessary to use something of iron, or, at least, something black. This may account for the following conversation reported by Ibbetson:

Sáhib.—"Why don't you keep that pretty child's face clean?"

Father.—Oh, Sáhib! a little black keeps off the evil eye."

The unusual derivation of the word *Ogre* from Orcus or Horkos, or Hades, is not quite satisfactory to some lexicographers, so Mr. Ibbetson offers another. In Rohtak a fakir was seen to eat of the body of a recently buried child which he had dug up. He said he learned to do this in the Jínd State, where it is a custom. Now these cannibal fakirs are called by the people *Oghars*, from Aghon, which means without fear, and is a title of Siva. These Oghars are the most depraved of mortals, for, instead of washing their bodies, they smear them with the worst of filth. They also drink out of human skulls, and outrage all laws of good behavior. The question arises whether this sect are at all chargeable with our word *ogre*.

On the northern border of the Panjab is Thibet, and the people of this vast

region are of great interest not only in their racial characteristics, but also in their religion. Mr. Hutton gives the following account of the election of a Grand Lama: "When a Grand Lama dies an inventory is made of all his effects, which are carefully sealed up until his reappearnce in life to claim them. Suppose a Grand Lama were to die in Chinese Tartary and to appear at Nako in Hangrang in the form of some Lama's child. This child would be known to be the new Grand Lama from his laying claim to the sealed-up effects of the deceased Grand Lama. He is then called on to state what these effects consist of, and where they are. He accordingly describes them one after another. If doubt still remain, the effect of the deceased are brought and mixed with other things, and the young aspirant is directed to show which are his. If further proof be still necessary the child is desired to give some token of the Grand Lama, which he does by commanding them to carry him to some spot which he points out, and then he places his hand or foot on a large stone, when, if the spirit of the Lama really be in him, the impression remains indented in the rock."

The same author describes the *mani*, or praying machines. The word *mani* is applied to a small barrel-shaped instrument, about two or three inches long, which is made to revolve round an axis, one end of which is held in the hand. The oftener this is made to revolve in a day, the greater the chance of the operator going to heaven. It is laid aside when the possessor is employed in laborious work or in any occupation requiring the assistance of both hands, but the instant that task is accomplished the whirling of the *mani* is resumed. In it are enclosed a few scraps of paper inscribed by the Lamas with some sacred sentences.

ANIMAL MOUNDS FOUND IN WISCONSIN.

PROF. WRIGHT, OBERLIN.

The ancient earthworks of Wisconsin are not remarkable for their size, but for the number among them representing animal forms. It will be remembered that in Ohio three of the mounds enumerated were of this character, viz: the Alligator in Granville, the Eagle in Newark, and the Serpent in Adams County. Those three are exceptional in that region, but in Wisconsin mounds in the shape of animal figures are the rule, and over the southern part of the State are very numerous. They are specially abundant in the vicinity of Milwaukee, near Lake Horicon, around Lake Winnebago, at Madison, and to the southeast, in the upper valley of the Fox River, and the lower portion of the Valley of the Wisconsin, and for some distance along the Mississippi River, above Prairie du Chien. Small mounds occur all over this region, but most of them are simply piles of dirt beneath which the dead were buried.

In that portion of Milwaukee known as Sherman's Addition there was formerly a rude representation of a wolf or a fox guarding a large though low mound

immediately before it. The elevation was slight, but the outlines were clearly traceable. The body of the animal was forty-four feet long, and the tail sixty-three feet. Near by was the more graceful figure of an otter, whose head and neck were twenty-six feet long, body fifty feet, and tail seventy feet.

In the same vicinity was another, shaped like a bird, whose body was thirty-four feet long, and half-folded wings, sixty feet. But it will not do to dwell too long upon this region, where so many of the works have been destroyed by the growth of the city. In a distance of twenty miles up and down the Milwaukee River these strange forms occur by the score, if not by the hundred.

Passing to the valley of the Pishtaka, there are, if not destroyed, two turtle mounds and several of conical form on the northeast shore of Lake Geneva. At Big Bend, about twenty miles south of Waukesha, a large space is covered with mounds resembling lizards, alligators, and flying dragons. Their heads point up hill and toward the southwest. The largest of the three dragons leading the host measures 200 feet from tip to tip of his wings. Simple oblong figures follow for nearly half a mile. The largest of the train, shaped somewhat like a lizard, is 286 feet in length.

Waukesha is another interesting center of animal mounds. Here stood what was called the turtle mound, the body of which was fifty-six feet in length, and the tail 250 feet, and the height six feet. This, however, was obliterated many years ago by the advance of civilization. But other forms no less remarkable on the grounds of Carroll College and on Bird Hill still remain.

A mile and a half southeast of Pewaukee, in this same lake region, occurs a remarkable collection of seven lizards, two turtles and four oblong mounds. One of the turtle mounds whose head has been injured by the road, is 450 feet long. Three of them have curled tails, and the tail of one of them is turned clear back. It will be observed that here, as in Ohio, the mound-builders chose for the scene of their operations the places that are still most frequented by civilized man. This whole region is now one vast summer resort.

Passing westward to the valley of Rock River, the mounds on the shores of Lake Koshkonong are worthy of note. At one place a series of mounds extends along the high lands for two miles. The most prominent figures are turtles with short tails. One of the turtles is fifty feet wide at the point of greatest expansion and seventy feet long and from five to six feet high.

At Aztalan, twenty miles above Lake Koshkonong, occurs the only ancient inclosure found in the State, and one which resembles in many respects several of the inclosures described in Ohio. This at Aztalan is rectangular, and contains about eighteen acres. The embankment is about five feet high, with twenty-five feet base. The total length is 2,750 feet, making about 10,000 cubic yards. Within are several truncated mounds of moderate size. The earth within the inclosure is found to have been burned, making it somewhat resemble brick; but there is no evidence of brick having been shaped by molding. The bricks

of Aztalan are simply shapeless clods of clay hardened by fire built on the surface. Dr. Schliemann describes such in ancient Troy.

We advise the citizens of Wisconsin to visit Aztalan before going to Europe. lest they share in the chagrin which one of the most learned antiquarians of our country (Prof. James Davie Butler, LL.D.) so frankly confesses to have overtaken him not long ago. European savans make long journeys to see these ancient works, though in themselves the ruins are much less important than any one of several in Ohio. Dr. Butler writes:

It has often been a matter of shame to me that, while living a quarter of a century in Wisconsin, my feet had never stood within the gates of Aztalan. My having passed it by on the other side was a special mortification to me when questioned about it—as if it were the only object of interest in our State—by savans in France, Germany and Italy.

Passing up to Madison, we find a number of animal mounds overlooking the beautiful lakes in the midst of which the capital is built; and for many miles westward, along the great Indian trail, or war-path, from Lake Michigan to the Mississippi, mounds are specially abundant. About eighteen miles west of Madison on this trail, "six quadrupeds, six mounds in the form of a parallelogram, one circular tumulus, one effigy of the human figure, and a small circle, extend in line for about a half a mile." The animals somewhat resemble bears, and are from ninety to 120 feet long. The human figure is 125 feet long, and 140 feet from the extremity of one arm to the other, the body thirty feet wide, the head twenty-five feet in diameter. The elevation of this mound is about six feet. These forms are situated upon an open prairie, on the dividing ridge between the Rock and Wisconsin Rivers.

Passing west and north, into the valley of the Wisconsin River, we find ourselves in what has been called the great central seat of the population which erected animal-shaped earthworks. From the Lemonwier River above the Dells, to Prairie du Chien, these singular works of art are found by the hundred. The fantastic forms of birds, lizards, buffaloes and human beings dot the sandy plains about Baraboo, adorn the single grassy slope which interrupts the wild and rugged shore of Devil's Lake and line the fertile interval which marks the course of the Wisconsin River to its junction with the Mississippi. "The valley of the Wisconsin River above Prairie du Sac for three or four miles is completely filled with these [emblematic] mounds." Here in one place are a number of bird-shaped mounds, with bodies eighty feet long, and outspreading wings 120 feet from tip to tip. In another place, near Honey Creek, is a pair of buffalo mounds, one of which represents the animal as 100 feet long and forty feet high. In another place is the representation of a bear, ninety feet long and twenty feet broad. In another place still is a gigantic bird with a forked tail and stretched wings 150 feet from tip to tip.

Time and space are too limited to go into further particulars. On ascending the Mississippi, a few miles above the mouth of the Wisconsin, and going eastward to the dividing ridge between the Mississippi and the Kickapoo, the road is

for some distance lined with mounds, made to represent birds and buffaloes. Few animal-mounds are found south of the State line, but eight miles below the mouth of the Wisconsin River, on the sandy bottom-lands of the Mississippi, where they are sufficiently high to secure from all floods, there is a figure known as the Big Elephant Mound, which, according to the measurements given, is 135 feet long, sixty feet broad (from the bottom of his feet to his back), with a trunk, or proboscis thirty-one feet long. The head is large and the proportions of the whole are symmetrical. Rev. S. D. Peet calls attention to the resemblance between the various buffalo mounds and this elephant mound, and intimates that we need to be cautious about indulging in confident speculations based upon the reality of this being designed to represent the figure of an elephant. Still, Moses Strong, of the State Geological Survey, says it resembles an elephant much more closely than any other animal, and the resemblance is much more perfect in this than in other effigies.

It should be remarked, with reference to these animal mounds in general, that some one feature of the figure is usually greatly distorted. In the figures of the human body, for instance, the arms are nearly always of inordinate length. A squirrel, on the Wisconsin River, has a body forty-six feet long and a tail nearly 100. The wings of the birds are likewise usually of an enormous length, as well as the tails of the lizards. I should rather maintain, even in the face of the general opinion of the neighborhood, that the so-called Elephant Mound was a buffalo with his nose unnaturally prolonged, than to be compelled to maintain that the mound-builders of Wisconsin were familiar with the form of the elephant. —*Chicago Advance.*

NEWLY DISCOVERED RUINS OF CLIFF CITIES IN ARIZONA.

Mr. James Stevenson, of the Geological Survey, has reported to Maj. Powell as one of the results of his last season's field operations the discovery of several more ruined cave and cliff cities, differing in some respects from any he had before examined. The most remarkable was a village of sixty-five underground dwellings, situated near the summit of one of the volcanic foot hills of the San Francisco Mountains in the San Juan region of Arizona. The surface stratum of the hill had by exposure become hardened and formed the common roof for the entire community. The dwellings were excavated after a common pattern, and a description of one gives one an idea of the whole. They had no intercommunication beneath the surface, and were only accessible by means of square holes leading from the surface by a vertical shaft to the floor of the main room of the dwelling. Foot rests—holes at convenient distances—along the sides of the shaft served the purposes of a stairway.

Descending the shaft, the explorers found themselves at the side of an oval-shaped, arched roof, room, about twenty feet in its smallest diameter. At the ends and in the opposite entrance low doorways connected the main room

with smaller rooms, the whole suite or dwelling consisting of four apartments. One of the smaller rooms had its floor excavated to a depth of two or three feet below those of the other rooms, and is supposed to have served the purpose of a store room or cellar for the ancient occupants. The other small rooms may have been bed-rooms. A groove eighteen inches deep by fifteen in width extending from the floor of the main room up one side of the shaft to the surface of the hill. its bottom filled with ashes, and its sides blackened by smoke, formed the fireplace and chimney of the establishment. Around the mouth of the shaft a stone wall was found, forming by its enclosure a kind of door-yard to the dwelling below. The wall, doubtless, served the double purpose of guarding against snow-slides, which might otherwise fill up the rooms and bury the occupants, and against the accidental fall of an inhabitant into his own or his neighbor's dwelling, upsetting the dinner-pot and possibly breaking his neck in the operation. Considerable debris was found in these ancient dwellings, an examination of which led to the discovery of many *curios*, illustrating some of the social and domestic customs of the extinct race. Stone mauls and axes, the implements used in excavating the dwellings; pottery bearing a great variety of ornamentation, bone awls and needles of delicate workmanship, the metate or family grinding stone for grain, its well worn surface indicating long use; shell and obsidian ornaments, and implements of wood—the uses of which were undiscoverable—were among the trophies of the exploration. Search was made for a water course or spring, but no appearance of the existence of water in the neighborhood during recent centuries was discovered. There were signs of intercommunication between this village and a cliff city some fifteen miles distant; also a new discovery which indicated the contemporaneous inhabitancy of the two. This city, or, rather, cluster of villages, occupied the sides of a cañon which has recently been christened Walnut Cañon. It is an immense fissure in the earth, with nothing above the general level of the country to indicate its existence to the traveler until he stands upon the sides of its almost precipitous brink. The sides have been gullied by storms and torrents, leaving shallow, cave-like places of great length at different heights, along the bottoms of which, whenever the ledge furnishes a sufficient area, dwellings in groups or singly were built. The season was well advanced when the place was reached, and only little time was spent in its exploration. All the ancient methods of approach had been long before worn away, and access to the nearest of the groups of houses was a work of difficulty.

The group or village which was most narrowly examined, was about three-quarters of a mile in length, and consisted of a single row of houses, the common rear wall being the lining rock, while the sides and fronts were made of large squared stones laid in clay. A narrow street or pathway extended along the entire front. Other and similar villages could be seen along the cañon for a distance of five miles.

Among the relics found here was a wooden spindle whirl similar to those in use by the Pueblos of the present time, but unlike them in the apparent manner of its manufacture. Nothing indicating the use of metallic tools of any descrip-

tion was discovered. The surface of the wood of which the whirl was formed had apparently been charred and then ground down to the required size and shape by rubbing it upon sandstone. A shaft of reed, similar to bamboo, a species entirely unknown in that region at this time, still remained in the whirl. It had been broken by the ancient workman, and neatly mended by winding about it a piece of fine twine. The ends of this twine being examined under the microscope, disclosed the fact that its fiber was of very fine human hair. Articles of wood, corn-cobs and even the perfect grains of corn, walnuts, bones of elk, antelope, and wolf, portions of wearing apparel of a fabric resembling the mummy cloth of Egypt, but made from material unfamiliar to the explorers, and other perishable articles were found in abundance buried in the piles of debris which partially filled these deserted homes, and would at first thought, seem to indicate somewhat recent inhabitancy. On the other hand, however, the preservative qualities of the atmosphere of this region are remarkable, and it is the belief of the explorers that centuries have elapsed since the last of the departed race or races occupied these old cities and villages as houses.

The absence of the weapons of war, of works of defense other than such as are constituted by the selection of almost inaccessible localities, of temples or idols, of hieroglyphics or pictures, together with the durability and solidity of the dwellings, so different from anything to be found of the handiwork of existing uncivilized races of that region, and the wide extent of these ruins, indicating the existence of allied races covering large portions of the present territories of Arizona, New Mexico, and Utah, as well as northern Mexico, are the elements of the problems involved in the origin, history, and disappearance of these races; problems which seem no nearer solution than when Coronado, nearly 400 years ago, made a raid for the purposes of conquest, among these places, and through his priests gave to the world the first meagre accounts of them—then as now, vacant and ruined.—*National Republican.*

AN AZTEC CALENDAR.

At a recent meeting of the California Academy of Sciences, held at San Francisco, Eusebio Molera, a graduate of the University of Madrid, who has distinguished himself by his antiquarian researches, read a paper on the Aztec Calendar, or Mexican calendar stone, from which an insight has been obtained to the extent of the astronomical knowledge of the Aztecs.

The stone was unearthed in the City of Mexico on the 17th of September, 1790, and was placed in the base of one of the towers of the cathedral, where it remains to this day. The stone is eleven feet nine inches in diameter, and originally weighed twenty-four tons. The conjectures of a number of antiquarians in relation to this object were revived by Molera, who described its prominent characteristics by means of a painting of the same size as the original, which was prepared by himself. The central figure was a picture of the Sun's face, a

distorted human countenance, and about it were geometrical signs, and figures of animals, reptiles, birds, and specimens of vegetation.

There were characters the interpretation of which presented a history of the creation of the earth. There was a period when there was no sun and the tigers came out of the woods and devoured everything. After a time the sun "died again," and there were great hurricanes of wind, causing them to perish. Another age was that of the flood, when everything was submerged, and the last epoch was that of fire, and men became birds. Around and about these central figures were cycles containing representations of the days of the month, the days of the year and other peculiarities.

Some antiquarians thought that it was a calendar stone, but Mr. Molera had an idea that it was designed for one of the sacrificial stones on which captives were slain, their hearts being offered to the sun. He believed it was constructed under the second Montezuma, who, having done nothing to perpetuate his name, determined to construct a sacrificial stone, the same as his predecessors had done. He wanted to make it larger than any of the others, and gave orders that it be two elbows larger than they were.

The Indians began hauling the stone, which finally said it would not go any further. There were 10,000 Indians pulling the stone, and the ropes broke and the stone would not move. This the historians cite to show that supernatural phenomena were connected with the event. However, it appears that the stone was really brought to town, and it was so heavy that it broke the canal and fell down.

GEOLOGY.

A GEOLOGICAL LESSON.

PROF. S. H. TROWBRIDGE, GLASGOW, MO.

As a simple illustration of the way in which nature should be taught, and of the ease with which young persons can be interested in nature studies, I will give a true and consecutive account of an hour's ramble of Mr. Inquisitive and his three little boys, aged nine, seven, and five years, and, for convenience, named by the numbers indicating their respective ages.

After leaving the street on which they live, and perhaps three minutes from home, they come to the top of a hill from which could be seen several other hills with valleys or ravines between them. Here the father gave the boys the first scientific problem to solve for themselves, in this form: "How came the valleys between all these hills?" The first solution, given almost immediately

by Five, was, "water washed the valleys out." Their attention having previously been called to the miniature mountains and volcanoes formed in the process of cooking mush, the second answer, from Seven, was that "volcanoes had thrown up the hills leaving valleys between." Here were two possible solutions to the problem, which are now to be tested. [Nine, in these inquiries, was expected to withhold his opinion and act only as a reserve to be called on when more wisdom was needed.] An objection raised against Seven's theory was, "if of volcanic origin, the hills ought to show rocks upon their sides or top." But these were nowhere to be seen. Seven urged the objection against Five's theory, that the valleys were covered with grass and water, and gullies were not. On descending the slope of this first hill, Seven saw a gully, which he acknowledged had been washed out by water, in parts of which grass was growing. On reaching the valley below, he found a larger gully in which more grass was growing, and a little further on could see a broad ravine, or valley, in which a small stream was still running, and this all had previously seen swollen to a river of considerable size. By this time Seven was ready to admit that Five had given the correct solution.

In the first valley they entered, the second problem which presented itself was this: "How high *was* the ground, where the valleys now are, before any was washed away?" After some wild guessing by Five and Seven, Nine, after noticing that the several hills about them were nearly of the same height, answered that it must have been as high as the hills are now. By looking to the head of this same valley, they could see that the high ground is still being washed away, and the valley even now extending, with each washing rain, farther and farther in that direction.

A few steps beyond, they come to a ravine on whose edge, twenty-six inches below the surface, which was covered with a thick turf, a long streak of brick red earth appears with occasionally a few bricks, and, in one place, a pile of unplastered bricks. This suggested for problem three the question how the red earth and these bricks came there, lying as all did upon a rich, black soil. Nine answered promptly, "There must have been once a brick-kiln here." From the resemblance to the surface of other brick-kilns they had before visited, all were satisfied with this solution, though a kiln in this place was never seen or heard of by any one of the party. Problem four was at hand in the question how the brick-yard became covered over two feet deep with earth. The answer was equally at hand in the obvious fact that this was at the foot of a long valley from whose head the earth was still being washed down by every rain and deposited as the water spread out over the flat surface below. Next came problem five in the query whether the washing in of the earth to cover the brick-yard was before or after the washing out of the gully which now reveals its former existence. The answer to this was too plain for dispute, though, strange to say, rather slow in coming. Bricks exposed on the edge and tumbled into this gulch prove it of later origin. Land-slides and faults on the opposite side of this ravine had before received attention and were no longer problems but *facts*, worthy of

no special attention except to test the permanancy of previous study and conclusions. This they did satisfactorily.

Passing on a few hundred yards, they came to a railroad cut, showing at the bottom a red deposit with rounded pebbles of all kinds scattered through it, and above, with a distinct line of division between the two, a yellowish colored bed made up of fine sand and no pebbles. This dividing line varies in height, often with wavy outline as the slope of the cut was washed into in places, sometimes running out of sight at the level of the track and again disappearing at the top of the slope. An explanation of this varying line between dissimilar deposits is the sixth problem. Nine, after following the undulations of the line for some distance, concludes that there were hills and valleys in the lower red layer when the buff layer began to be deposited, and that the curved line marks the outline of the old surface. Problem seven inquires what were the conditions under which the top and bottom layers were deposited, running or standing water? Its absence of pebbles and entire composition of minute particles led Nine to conclude, after a suggestive question or two, that the top stratum must have settled to the bottom of quiet water like a vast lake, and that the small rounded pebbles in the bottom layer must have been pushed and tumbled to their places by gently running water. Shells of various kinds in the upper layer suggested for problem eight the inquiry as to how they came there. The bottom of ponds, from which specimens had previously been collected, with living and dead shells in the soft fine mud, soon to be covered out of sight by a later deposit of mud from soil washed in by the next rain, furnished to all a ready and satisfactory answer.

A little further on, a bone sticking out from a bank twenty inches below the turf-grown surface, furnishes for problem nine the question whether it is of ancient or recent origin. By digging the earth away from around it, a strip of tin from a cast-off cooking vessel soon came to light, and on the same level with the bone several fragments of brick, which proved to even the youngest that the bone had lain there no longer than the tin and brick, and, consequently, was recent. Its toughness when pounded, showing the presence still of animal matter, and its equine characteristics, make the conclusion still more satisfactory.

Nearer the river they find large boulders of limestone, granite, etc., with no sharp corners or edges but all with a more or less rounded form. Problem ten inquires how they came thus rounded. Seven answers at once, "by being rolled and bumped against other stones by running water." At a sudden bend in the river, on a slope of the bluff which deflects the river's course, was found a large pile of rocks of all kinds and sizes, some entirely unlike any in beds within hundreds of miles. And problem eleven asks how they came there and where they came from. Nine explains that they were frozen in cakes of ice, floated down the river in the spring, perhaps from a great distance, lodged on the slope in a "block" of the ice, and left there when the river fell and the ice melted. Nine also notices, near the water's edge on the gradual slope of the river bank, the benches or stair-like surfaces one above another, and recognizes them as miniature illustrations of the terraces along the Connecticut River, left

at different heights as the high water gradually receded, which he saw when on a visit to his grandfather in Vermont.

Now such familiar facts as these, which are fair *representatives* of what may be found in an hour's walk in almost any country place, may easily be made the basis of a large amount of geological knowledge which will be a real acquisition, and not the utterly hypothetical and intangible stuff as a substitute for knowledge, which one *gets* from mere text-book perusal. When the student, whether young or old, has once grasped the idea, from *actual observation*, that the hills and valleys in our surface soil are caused by the erosive power of water, he is, for the first time, ready to comprehend the broader facts of mountain sculpture, cañon erosion, and denudation, which have wrought such stupendous changes upon the surface of our globe.

From the simple discovery of a bone or shells in the soil, or a buried brick-yard, the thoughts natually expand to the closely related facts of the origin of fossiliferous beds; the mode of deposition of stratified and sedimentary rocks, varying in aggregate thickness over the earth's surface from a few inches to fifteen or twenty miles; and the order of succession of geologic events. And these embrace the whole of historical geology, and part of dynamical and lithological geology.

Again, the observation of rounded boulders in every creek-bed and often in higher positions; of the foreign or "lost rocks" often seen even in elevated fields; and of the thick and wide-spread deposits of the sandy loess in northern latitudes, which are just like the silty mud left high and deep nowadays after the flood waters of the muddy Missouri have subsided, forces unbidden upon the *thinking* mind a consideration of the unmeasured caps of moving ice progressing southward like an immense plow; the subsequent floods, perhaps more universal than Noah's, transporting and assorting unnumbered tons of material with overwhelming power; and the vast lakes of muddy water which succeeded.

Till the method of studying the earth's history,—not only by geologists, but by teachers and pupils in school,—proceeds from the known to the unknown, and the facts under our daily observation are made the starting point in explaining those of like character which occurred in ages past, we need not be surprised that students graduate with no practical knowledge of geology, for the lack of which their future fortunes are often destroyed; that good but simple men fear a knowledge of the works of God will weaken faith in his word and himself; or even at the inglorious boast of a "thorough" educator that he has "yet to learn any practical use for geology," and frequent ridiculous guesses in attempted explanation of scientific allusions in the Bible record.

EXPLORATIONS IN NORTHEASTERN OREGON.

CHAS. H. STERNBERG.

In the winter of 1878, while in San Francisco, I received orders from Prof. Cope to go to Oregon, or some other locality for fossil vertebrates. After a pleasant sea voyage of 700 miles, I arrived at Portland, Oregon, to find that the Columbia River was frozen above the upper cascades. In company with some twelve or fifteen men, I resolved to go up the river as far as I could, and trust to luck to get to the Dalles, and there take the stage for Walla Walla.

The river was open as far as the lower cascades. Here the party crossed the river and proceeded on foot for the Dalles, sixty miles above. The ground was covered with slush, and we found it hard work traveling. We had streams to cross, and were soon wet to the skin, but we trudged bravely on. I had a roll of blankets, a shot-gun and fishing rod. One man who had none, carried the blankets in consideration of which I agreed to share them with him at night, another carried the gun, in hopes of killing some game, and I disjointed the rod for walking sticks. When night overtook us, we found an old deserted house, which had been used for a hotel when the railroad was on this side. The question now arose what could we eat, we had been so anxious to reach the Dalles that we had not thought we might get hungry on the road. One man, however, had been wise enough to buy a box of herrings, and another a sack of crackers. We found some tin cans. In a large fire-place we built a comfortable fire, and put on snow to melt and I broiled our herrings on sticks before the fire, and these with the crackers made us a hearty meal. The herrings made us so thirsty that we had to take turns all night melting snow. The next day we again started and after travelling a short distance found a house that was inhabited, and got something to eat. We resolved to wait here in hopes that the boat would make its way down from the Dalles. After two or three days waiting we again started on our journey. I purchased a pony for $10 and got along very comfortably. After going a couple of miles, we saw the steamer coming down the river. We all returned to the landing, and I sold my pony to the one I purchased it from for $7, a pretty expensive trade, as I had paid $10 for it a couple of hours before. We met with no more adventures, and reached Walla Walla safely.

I spent the winter in Washington Territory, and in April procured an outfit and two assistants in Walla Walla and started for the John Day fossil beds. We passed through a magnificent farming country, where great wheat fields stretched out on either side, crossed the Blue Mountains into the Grand Rounde Valley, which is about forty miles long, and twenty miles wide and thickly settled. By examination I became convinced that this valley was the bed of an ancient lake, and from this place we passed through the jagged peaks of Powder River Mountains and into the John Day River valley. About twenty miles below Cañon City,

I discovered a bed of shaly clay, filled with the impressions of ercotyledonous plants and fish bones; near by was a large clay bank in which I saw an example of insects taking advantage of their environments. They were common mud wasps, and instead of making the ordinary mud nest, in which to deposit their eggs, they had dug circular holes into the clay bank, deposited their eggs, and the food for the larva, and closed the mouth with mud; the whole face of the bank was honey-combed in this way. A short distance below this place I found a ledge of soft clay stone that was so light that it floated in the water when thrown into the river. It will become valuable I think for making dynamite, as it must be a great absorber. Doubtless the ancients used such clay to make their floating bricks with.

Near the gorge in the John Day River we went into camp and prepared to pack our horses and go into the basin, as the fossil beds were called. Nearly all our work after that had to be done by means of pack animals, as there were only narrow bridle trails leading across the country. A good pack-horse will carry from 300 to 400 pounds on its back all day. At this place the John Day River, which had been flowing due west skirting the base of the mountains, made a right angle and going directly north cut a gorge about 500 feet deep right through the heart of the mountains, which were largely composed of basalt and other volcanic rocks. On the south side of the gorge lie the beds of the old Pliocene lakes. They are drab colored and wash easily, making picturesque hills, ridges, mounds, etc. They are topped by a thick bed of compact volcanic sand and ashes, which resemble, I am told, the material that covers the buried cities of Herculaneum and Pompeii. This great Pliocene lake had an outlet through the mountains by a great water-fall which had worked its way back until it cut out the gorge that emptied the lake. When we got in sight of the basin a beautiful view presented itself to us. The basin or cove is a semi-circular valley cut out of the mountains. From the water's edge to a height of about 500 feet were the brilliantly colored beds of the old miocene lake deposit, deep red, yellow, orange and green. They were principally of clay and are cut in the ordinary Bad Land scenery. Above is one escarpment above another of basaltic columns; these are often perfect prisms of from six to eight sides. On the very summit are forests of pines, their green blending with the rocks below, making very pretty scenery. We went into camp near a large fossil field and went enthusiastically to work. Very dangerous we found it clinging to the almost perpendicular bluffs or cutting niches for our feet as we made our way up some steep ascent, where one misstep would hurl us into a deep gorge below. From the valley we appeared very small clinging to perpendicular walls. Our toils were well rewarded, as nature always does reward persistent effort in searching for her buried treasures.

One unaccustomed to this kind of work would soon be convinced that no specimens could be found. We often searched a week, or more, with no success, and then perhaps found perfect specimens in the ground we had looked over again and again. Perhaps only the point of a tooth would be exposed,

which further work would prove to belong to a perfect skull and a perfect skeleton below. The remains were often preserved in hard concretions. When we found a skull preserved in this way we were always sure of a perfect specimen, the concretion, in its friendly embrace, retaining every process, tooth, or other delicate part, intact.

The most common species was what palæontologists call the *Oreodon*, a hog-like creature that lived in herds and was omnivorous in habit: they varied in size from a peccary to a large hog. We found a good many of the horse species, *Anchitherium*, etc.; these all had from three to five toes on their hind feet, and three on their front ones. I dicovered a large animal of the rhinoceros kind with two horns on the nasal bones, one on each side. We found great numbers of herbivorous beasts, and a corresponding number of carnivores. One species of the cat family had serrated teeth and was as large as a tiger. It resembled the saber-tooth tiger of this formation.

One very large animal I discovered was as large as the rhinoceros. It was new to science, and was provided with a large process on the humerus, and was called *Böocherus humerosus*, by Cope. We found about ten species of the cat family. Rodents were very common and we added a number of new species to science.

Fresh-water turtles were found, some were three or four feet long, their shells beautifully sculptured. Prof. E. D. Cope, the noted American palæontologist, has described all the species discovered by my expedition, and the work published by the Government is a large quarto volume with a great many beautiful lithographic plates. When I receive a copy I will try and give a more detailed description of my collections.

Whenever we got a load of fossils, or were out of provisions, we went into a small settlement on John Day River. One day in July, I think, I led in a horse packed with two boxes of fossils, and when I got to the house where I left my specimens, I found no one at home but the old gentleman. He told me that Gen. Howard had sent a courier through the settlement, advising all to gather together and build a stockade for protection, as a body of 300 Snake Indians were on the war-path, and would come down the South Fork of the John Day River and cross over to the Columbia. They had 3,000 stolen horses with them and killed all the settlers they met with, but would not be likely to attack a body of armed men. All the people but this old man had gone to Camp Watson, or Spanish Gulch, as they called it, and built a stockade. I loaded up my cartridges, got my Sharp's rifle in shape and stayed with the old man over night. One of my assistants came in that night, the other was still in the fossil fields, ignorant of any danger from Indians. Next day I went into the beds for him, we cached our tent, etc., and returned to the settlement, then all three of us, after we had cached our fossils, went to the stockade, where we found all the settlers in the neighborhood gathered together. The next day the Indians passed down the South Fork and across to Fox Prairie, about six miles from our ossil beds. On the route they killed three sheep-herders and burned one ranch,

and killed horses and sheep. I followed up their trail next day and found where they went into one house and poured out a barrel of molasses, covered it with flour and stuck a little dog in it, which was dead when I saw it. In another place they took out a lot of cheeses and rolled them along with sticks as a boy would a hoop. As they were not injured I put one in my pack. At Fox Prairie they caught a good many sheep and cut off their legs and threw the bodies in piles to die. Here they joined the Umatillas, and went to the Columbia where they killed a number of citizens, burnt Cayuse Station, etc. The day I followed their trail I saw a few horsemen and an ambulance coming down South Fork, they proved to be General Howard and staff. The General told me they, with the troops behind, were in pursuit of the hostiles and had had nothing to eat but fresh beef, without salt, for three days. I directed him to a smoke-house where there was plenty of bacon, and to a house where he found plenty to eat. The table was set, and the people had just sat down to dinner, when the alarm of Indians coming was given, and they fled, leaving everything.

The General and troops stayed here a short time waiting for their pack-train of rations to catch up with them, and recruit a little. He accomplished a great feat in bringing a wagon-train down a large hill called Jackass Hill, at the head of the South Fork. A great many wagons had been broken to pieces before in attempting to make the descent. None had ever been brought down before.

Luckily, Gen. Howard knew the plans of the Snakes, as he had with him as guide the Princess of Winnimucca, who knew all their plans and revealed them to Howard. They intended after leaving their reservation to strike directly north, steal all the horses they could and get the Columbia River Indians to join them and then to cross the Columbia, ravage Washington Territory and retreat into British Columbia, where they meant to sell their horses and be safe from our troops. Copying Sitting Bull's tactics Gen. Howard got men to the Columbia first, turned all the steamers into gun-boats, and patroled the river, preventing any one from crossing.

Chief Homily, of the Umatilla Indians, with a number of other chiefs, were captured on the charge of helping Egom, the chief of the Snakes, and were offered their liberty on condition that they capture or kill Egom; a reward of $2,000 being offered for his head. Homily with two of his braves went to meet Egom at a place that the two had agreed upon, where they were to consummate an agreement by which Homily was to join him in his raid. As they were riding along side by side, Homily gave a signal, and he and his men drew up their rifles and killed Egom and his followers; they cut off Egom's head and brought it to the U. S. officers, and claimed their reward of $2,000. It was the worst piece of treachery I ever heard of. This put an end to the war, the Indians, without a leader, left their horses and pack-animals, separated in small bands and fled; eventually returning to their reservation, where they were all captured.

After this my party and myself returned to our fossil fields. We had good success and added some thirteen new species of vertebrates to science. I spent two seasons in these rich fields, and obtained a great many fine specimens of

mammals and turtles which have been figured and described by Prof. E. D. Cope, the U. S. palæontologist, in the Oregon Fauna.

I was very much disappointed in Oregon. From what I had read in my boyhood, I supposed it was a rich farming country, with mild winters. I found it to consist of two distinct countries, as different from each other as Virginia is from Maine. Western Oregon, or the Willamette Valley ("a" pronounced like "a" in am), is a rich fertile country, with warm winters. It is the farmer's paradise: they raise from fifty to sixty bushels of wheat to the acre and let their land lie idle a year and reap forty bushels per acre as a volunteer crop. When I was there it was worth $1.00 per bushel in gold.

They have a rainy season for their winter, and it rains nearly every day for four or five months. Fruit grows very luxuriantly, they raise peaches, pears, grapes, apples, prunes, etc. The people are hospitable, good-natured and lazy. I have seen the ferns growing in the open fields. The north sides of their houses are covered with moss,—the people are called "moss-backs," or "web-footers."

Sixty miles east, or east of the Cascade Range, we find an entirely different country. It is rough and mountainous with but little farming land, and this is only on the water-courses where it can be irrigated. It seldom rains, and the climate resembles the plains of western Kansas. It is used chiefly as a range for cattle and sheep. The stockmen are very careless and allow their stock to run at large; they graze in the valleys and when these are eaten off go into the mountain. The consequence is that in winter the cattle are driven by the first storm into the valleys which they have already eaten bare, and many starve. If they were kept in the mountains in summer, where there is an endless range, the stockmen would find it to their advantage. Sheep are kept along the water-courses till they have destroyed the grass. I noticed along the Cañon City & Dalles Road, that there was no grass on either side of the road for three miles. Sage-brush and grease-wood had taken the place of the luxuriant bunch-grass. Nine-tenths of Oregon is composed of this rough, hilly country, fit only for stock. They do not feed their stock during the winter, which is often quite severe, depending entirely on the range and unless the winters are unusually severe they come through in good shape.

This is a splendid country for raising horses. They climb to the tops of the mountains in winter, where the snow has been blown off. I noticed a great deal of fine blooded stock. A stallion is given charge of a herd of mares, and he takes them to good grazing ground. The owners often see them but once or twice a year when they brand the colts.

LAWRENCE, KANSAS, February 4, 1884.

THE FIRST GEOLOGICAL EXPLORATION IN LOUISIANA.

E. L. BERTHOUD, C. E.

Among the concessions made by Law's company in Louisiana, in 1719–20, was that one made to Law, and embraced the lands on the Arkansas River, then known as "Arçansas Post," which was the point where Joutel, after La Salle's death, first reached the immediate valley of the Mississippi, and where he found two Frenchmen left there by Touti, La Salle's lieutenant, as a point of observation or rally for that great explorer's benefit.

In 1721 Arçansas Post consisted of four or five palisaded houses, a little guard-house, and a cabin serving as a store-room. In that year, Dumont says that he went with its commander, Capt. De la Harpe, Lieut. Franchomme, Sergeant Bessan and twenty-two men from that Post, to explore the Arçansas valleys in search of a reputed "Emerald rock" on that river. The party ascended the river 250 leagues, and then struck off inland fifty leagues more; they passed through a beautiful country; vast prairies covered with buffalo, stags, deer, etc. They found jasper, marble, and also slate and talc (selenite), very fit for plaster. They also discovered, they thought, a little stream that rolled "*gold dust.*" A salt spring also was found nearly 300 leagues from the sea. It is just possible De la Harpe reached into the country of the Big Bend of the Arkansas; if he did the Nescatunga Salt Plains and Salt Springs were visited by him. He may, perhaps, have been as far as the Wichita Mountains. But the emerald rock yet remains to be found, if it ever existed,—it was most probably carbonate of copper.

This expedition might be called the first geological exploration of Louisiana.

MORRISON, ILL., Feb. 9, 1884.

ED. KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY:

DEAR SIR,—I have just read Prof. G. C. Broadhead's article on "Flint Chips" in the current number of your valuable magazine, and it recalls to my mind a statement I once heard to the effect that there is no flint found in the United States. I have read the same statement in J. P. McLean's work on the "Mound Builders." Before I can accept this statement as true I would like more and better proof in its support. I have found specimens mingled with the drift overlying beds of Niagara rock in this vicinity and also in the gravel on the shore of the Mississippi River at Lyons, Iowa, that corresponds exactly with the most precise definitions for the term flint. I have specimens of flint from the Dover Cliffs, England, which though black in color are translucent along the edges, though more so than some specimens found near this locality.

The questions I would like to ask are: Is real flint found in this country or not, and if so, how can we tell flint from chert without chemical analysis?

Last summer the workmen in a quarry at this place found a fine specimen of a species ot Lepidodendron which I secured and have in my collection; in fact I have four specimens of it. The impression is in rather coarse sandstone belonging to the carboniferous age. The impressions of the bark are absolutely perfect, some of the finest lines being visible. From the same quarry are sometimes obtained specimens of calamites (Canneformis) so perfect that the joints are plainly visible, also the longitudinal flutings. Some of the specimens, most of them in fact, are branched, the branches being constricted near the main trunk, with short joints close to the same, but as it grows outward the branch lengthens and enlarges in diameter, at the same time curving upward until it becomes parallel with the trunk.

I have, in connection with my friend H. Baldwin, analyzed all the native and naturalized plants of this County that we have met with, consisting of nearly 1,000 species. I mean to arrange the work to exhibit at the County and perhaps at the Illinois State Fair.

S. A. MAXWELL.

PHYSICS.

THE SWISS EARTHQUAKE OF 1881.

ALBERT S. GATSCHET, WASHINGTON, D. C.

One of the observed earthquakes is the one that occurred in the level parts of Switzerland on the afternoon of January 27, 1881. A tertiary sandstone constitutes the main portion of the Swiss plateau, where the phenomenon was felt in its greatest intensity, the heaviest of the motion being at Berne and in its immediate vicinity.

Prof. Dr. A. Foster, the Director of the Telluric Observatory, at Berne, has gathered a large amount of well ascertained details about it and published them in an interesting quarto monograph of twenty-nine pages (Berne, B. F. Haller) under the title: "*Das Erdbeben der Schweizenchen Wochebene vom 27 Jan. 1881, (Berner Beben)*. The scientific results obtained by him may be summed up as follows: The principal shock took place at 2h. 19m. 53s. P. M.; it was preceded and followed by lighter oscillations of the soil and occurred at a time when the perihelion and the perigee coincided, though new moon was two and a half days later. The upper culmination of the moon had occurred five hours before. A long period of frost had just given way to a sudden thaw, but there were no disturbances of terrestrial magnetism several days before and after. The whole area set in motion, having a longitudinal extent of 260 kilometres, experienced the shock exactly at the same astronomical time: there was no central shock, for

the dislocation following the shock took place simultaneously upon the whole line. In the majority of places it consisted of a short succussory shaking followed by a few lateral and less energetic oscillations, the direction of all being approximatively from east to west. The mean duration was but three to four seconds, the intensity varying between three and eight degrees of the Swiss-Italian seismic scale, and the phenomenon has to be classed with the longitudinal earthquakes of a pre-eminently transversal direction. The noises connected with the seismic phenomena *preceded* the shock, or *were synchronous* with them; none were heard after the shock. South of Martigny (Valois) and north of Mulhouse (Alsace) no disturbance was felt, though oscillations had occurred two weeks before in Southern Germany, Piedmont and Lombardy.

EARLY HISTORY OF THE TELEGRAPH.

Although the electric telegraph is, comparatively speaking, a recent invention, yet methods of communication at a distance, by means of signals, have probably existed in all ages and in all nations. There is reason to believe that among the Greeks a system of telegraphy was in use, as the burning of Troy was certainly known in Greece very soon after it happened, and before any person had returned from Troy. Polybius names the different instruments used by the ancients for communicating information—"Pyrsia," because the signals were always made by means of fire lights. At first they communicated information of events in an imperfect manner, but a new method was invented by Cleoxenus, which was much improved by Polybius, as he himself informs us, and which may be described as follows:

Take the letters of the alphabet and arrange them on a board in five columns, each column containing five letters; then the man who signals would hold up with his left hand a number of torches which would represent the number of the column from which the letter is to be taken; and with his right hand a number of torches that will represent the particular letter in that column that is to be taken. It is thus easy to understand how the letters of a short sentence are communicated from station to station as far as required. This is the pyrsia or telegraph of Polybius.

It seems that the Romans had a method of telegraphing in their walled cities, either by a hollow formed in the masonry, or by a tube fixed thereto so as to confine the sound, in order to convey information to any part they liked. This method of communicating is in the present age frequently employed in the well-known speaking tubes. It does not appear that the moderns had thought of such a thing as a telegraph until 1661, when the Marquis of Worcester, in his "Century of Inventions," affirmed that he had discovered a method by which a man could hold discourse with his correspondent as far as they could reach, by night as well as by day; he did not, however, describe this invention.

Dr. Hooke delivered a discourse before the Royal Society in 1684, show-

ing how to communicate at great distances. In this discourse he asserts the possibility of conveying intelligence from one place to another at a distance of 120 miles as rapidly as a man can write what he would have sent. He takes to his aid the then recent invention of the telescope, and explains how characters exposed at one station on the top of one hill may be made visible to the next station on the top of the next hill. He invented twenty-four simple characters, each formed of a combination of three deal boards, each character representing a letter by the use of cords; these characters were pushed from behind a screen and exposed, and then withdrawn behind the screen again. It was not, however, until the French revolution that the telegraph was applied to practical purposes, but about the end of 1793 telegraphic communication was established between Paris and the frontiers, and shortly afterwards telegraphs were introduced into England.

The history of the invention and introduction of the electric telegraph by Prof Morse is one of inexhaustible interest and every incident relating to it is worthy of preservation. The incidents described below will be found of special interest. The article is from the pen of the late Judge Neilson Poe, and was the last paper written by him. He prepared it during his recent illness, the letter embodied in it from Mr. Latrobe being of course obtained at the time of its date. It is as follows:

On the 5th of April, 1843, when the monthly meeting of the Directors of Baltimore & Ohio Railroad Company was about to adjourn, the President, the Hon. Louis McLane, rose with a paper in his hand which he said he had almost overlooked, and which the Secretary would read. It proved to be an application from Prof. Morse for the privilege of laying the wires of his electric telegraph along the line of the railroad between Baltimore and Washington, and was accompanied by a communication from B. H. Latrobe, Esq., Chief Engineer, recommending the project as worthy of encouragement.

On motion of John Spear Nicholas, seconded by the Hon. John P. Kennedy, the following resolution was then considered:

Resolved, "That the President be authorized to afford Mr. Morse such facilities as may be requisite to give his invention a proper trial upon the Washington Road, provided in his opinion and in that of the engineer it can be done without injury to the road and without embarrassment to the operations of the company, and provided Mr. Morse will concede to the company the use of the telegraph upon the road without expense, and reserving to the company the right of discontinuing the use if, *upon experiment*, it should prove *in any manner injurious*."

"Whatever," said Mr. McLane, "may be our individual opinions as to the feasibility of Mr. Morse's invention, it seems to me that it is our duty to concede to him the privilege he asks, and to lend him all the aid in our power, especially as the resolution carefully protects the company against all present or future injury to its works, and secures us the right of requiring its removal at any time."

[In view of the fact that no railroad can now be run safely without the aid of the telegraph, the cautious care with which the right to remove it if it should become a nuisance was reserved, strikes one at this day as nearly ludicrous.]

A short pause ensued, and the assent of the company was about to be assumed, when one of the older directors, famed for the vigilance with which he watched even the most trivial measure, begged to be heard.

He admitted that the rights and interests of the work were all carefully guarded by the terms of the resolution, and that the company was not called upon to lay out any of its means for the promotion of the scheme. But notwithstanding all this, he did not feel, as a conscientious man, that he could, without further examination, give his vote for the resolution. He knew that this idea of Mr. Morse, however plausible it might appear to theorists and dreamers, and so-called men of science, was regarded by all practical people as destined, like many other similar projects, to certain failure, and must consequently result in loss and possibly ruin to Mr. Morse. For one, he felt conscientiously scrupulous in giving a vote which would aid or tempt a visionary enthusiast to ruin himself.

Fortunately, the views of this cautious, practical man did not prevail. A few words from the mover of the resolution, Mr. Nicholas, who still lives to behold the wonders he helped to create, and from Mr. Kennedy, without whose aid the appropriation would not have passed the House of Representatives, relieved the other directors from all fear of contributing to Mr. Morse's ruin, and the resolution was adopted. Of the President and thirty directors who took part in this transaction, only three, Samuel W. Smith, John Spear Nicholas, and the writer survive. Under it Morse at once entered upon that test of his invention whose fruits are now enjoyed by the people of all the continents.

It was not, however, until the spring of 1844 that he had his line and its appointments in such a condition as to allow the transmission of messages between the two cities, and it was in May of that year that the incident occurred which has chiefly led to the writing of this paper.

* * * * * * *

MR. LATROBE'S RECOLLECTIONS.

My. Dear Mr. Poe:—Agreeably to my promise, this morning I put on paper my recollection of the introduction of the magnetic telegraph between Baltimore and Washington. I was counsel of the Baltimore & Ohio Railroad Company at the time, and calling on Mr. Louis McLane, the President, on some professional matter, was asked in the course of conversation whether I knew anything about an electric telegraph which the inventor, who had obtained an appropriation from Congress, wanted to lay down on the Washington branch of the road. He said he expected Mr. Morse, the inventor, to call on him, when he would introduce me to him, and would be glad if I took an opportunity to go over the subject with him and afterward let him, Mr. McLane, know what I thought about it. While we were yet speaking, Mr. Morse made his appearance,

and when Mr. McLane introduced me he referred to the fact that, as I had been educated at West Point, I might the more readily understand the scientific bearings of Mr. Morse's invention. The President's office being no place for prolonged conversation, it was agreed that Mr. Morse should take tea at my dwelling, when we would go over the whole subject. We met accordingly, and it was late in the night before we parted. Mr. Morse went over the history of his invention from the beginning with an interest and enthusiasm that had survived the wearying toil of an application to Congress, and with the aid of diagrams drawn on the instant, made me master of the matter, and wrote for me the telegraphic alphabet which is still in use over the world. Not a small part of what Mr. Morse said on this occasion had reference to the future of his invention, its influence upon communities and individuals, and I remember regarding as the wild speculations of an active imagination what he prophesied in this connection, and which I have lived to see even more than realized. Nor was his conversation confined to his invention. A distinguished artist, an educated gentleman, an observant traveler, it was delightful to hear him talk, and at this late day I recall few more pleasant evenings than the only one I passed in his company.

Of course, my first visit the next morning was to Mr. McLane to make my report. By this time I had become almost as enthusiastic as Mr. Morse himself, and repeated what had passed between us. I soon saw that Mr. McLane was becoming as eager for the construction of the line to Washington as Mr. Morse could desire. He entered warmly into the spirit of the thing, and laughed heartily, if not incredulously, when I told him that although he had been Minister to England, Secretary of State, and Secretary of the Treasury, his name would be forgotten, while that of Morse would never cease to be remembered with gratitude and praise. We then considered the question as to the right of the company to permit the line to be laid in the bed of the road—the plan of construction at that time being to bury in a trench some eight or ten inches deep a half-inch leaden tube containing the wrapped wire that was to form the electric circuit. About this there was, in my opinion, no doubt, and it was not long after that that the work of construction commenced. I met Mr. Morse from time to time while he lived, and often recurred to the evening's discussion at my house in Baltimore.

The above is the substance of what I have more than once related to other persons. I hope you will persist in your design of putting on paper your own very interesting recollections in this connection, and if what I have contributed of mine is of service to you, I shall be much pleased.

Most truly yours, JOHN H. B. LATROBE.

MARCH 3, 1881.

THE DIVINING ROD.

Prof. Rossiter W. Raymond, in the *Engineering and Mining Journal*, gives the history and traditions of the divining rod at great length, and, summing up, reaches the following among other conclusions:

The application of the rod to the discovery of metals, coal, buried treasure, etc., is shown abundantly to be chimerical. The rules and methods, as well as the asserted performances of its professors, contradict each other, and innumerable failures and exposures have justly covered with ridicule their pretensions.

The transparent humbug of locating wells with the rod, to strike oil at depths from a hundred to a thousand feet, needs no comment. In this case, there are positively no signs by which a given spot can be selected. The experience of neighbors may show a certain area to be productive; and within that area a certain line may be inferred, sometimes, to be the line of a productive channel. But if a keen observer, having gone so far, professes to select a point on that line, he is simply betting on his luck, and, as carried on in Pennsylvania, the bet is a safe one for the oil-smeller who gets a handsome fee if he wins, and loses in the opposite event nothing but an hour or two of time.

The case is somewhat different with the discovery of springs, and (since ore deposits always have been and often still are the channels of springs) of ore deposits. Here we have much stronger and more abundant evidence in favor of the rod, and here, in my judgment, there is a residuum of scientific value after making all necessary deductions for exaggeration, self-deception and fraud.

He then explains that skillful prospectors can scarcely explain how they decide upon the place they are to dig, but that long experience and close observation have enabled them to make good decisions without conscious reasoning, and that in their hands the divining rod would be unconsciously moved by involuntary muscular action in the determined direction. He also thinks that a purely physical effect as of relative cold may be produced on a highly sensitive organization as it passes over a subterranean spring. In conclusion he says of the divining rod:

In itself it is nothing. Its claims to virtues derived from Deity, from Satan, from affinities and sympathies, from corpuscular effluvia, from electrical currents, from passive perturbatory qualities or organic-electric force, are hopelessly collapsed and discarded. A whole library of learned rubbish about it which remains to us furnishes jargon for charlatans, marvelous tales for fools and amusement for antiquarians; otherwise it is only fit to constitute part of Mr. Caxton's "History of Human Error." And the sphere of the divining rod has shrunk with its authority. In one department after another it has been found useless. Even in the one application left to it with any show of reason it is nothing unless held in skillful hands, and whoever has the skill may dispense with the rod. It belongs with "the magic pendulum" and "Planchette," among the toys of children.

Or if it be worthy the attention of scientific students, it is the students of psychology and biology, not of geology and hydroscopy and the science of ore deposits, who can profitably consider it. For us miners and prospectors the advice holds good which was given us 300 years ago by the wise Agricola, the father of our profession, who says the believers in the rod find some veins with it by accident. "But the same people much more frequently lose their pains, and in order to discover veins have to fatigue themselves with digging, not the less than the miners of the opposite school."

MEDICINE AND HYGIENE.

STOVE AND FURNACE HEAT.

DR. A. N. BELL.

So much has been said recently about the germ origin of disease, that people generally are in danger of having their attention diverted from prevalent tangible causes of diseases within easy control, while catching at shadows. First among the controllable causes of ill-health in temperate and cold climates is an excessively variable or foul indoor atmosphere, due to defects in the mode of warming houses. Exposure to a temperature much below that of animal heat for any considerable time always weakens vitality and increases the susceptibility to disease. Hence, the economy of heat is a primary element in the art of preserving health. Of the common means to this end—clothing, houses, and fire—the last only is the subject of this article, and with special reference to the relative merits, from the sanitary point of view, of stoves and furnaces as compared with steam. Simply to obtain the necessary degree of temperature would be an easy matter, but ventilation must be constantly kept in view, and this cannot be secured without some sacrifice of heat. Time was when the open fire-place was regarded as the *conditio sine quâ non* of health; but, as Rumford put it, "while the draughts chill one part of the body, the rest is roasted by the fire in the fire-place, and this cannot but be injurious to health."

A close stove, everybody knows, is simply a hollow cylinder, or box, made of metal, brick, or earthenware, which is heated by a fire within it, and gives out its heat to the air by contact, and to surrounding solid objects by radiation. In an economical point of view it excels all other means of warming. The heated air from a fire-place is available to the apartment for only about twelve per cent of the total amount of heat produced: all the rest passes up the chimney. The close stove, on the contrary, utilizes from eighty-five to ninety per cent of the heat produced, and loses through the smoke-pipe only about as much as the open fire-place saves—ten to fifteen per cent. And herein lies the striking difference between the relative healthiness of the atmosphere heated by a close stove

and an open fire-place. The amount of air which hourly passes through a close stove, heated with a brisk fire, is, on an average, equal to only about one-tenth of the capacity of the room warmed, and consequently such stove requires, if unaided, ten hours to effect a change of the atmosphere in every such apartment. Thus stagnant and heated, the air becomes filled with the impurities of respiration and cutaneous transpiration.

Moisture, too, is an important consideration. The atmosphere, whether within doors or without, can only contain a certain proportion of moisture to each cubic foot, and no more, according to temperature. At eighty degrees it is capable of containing five times as much as at thirty-two degrees. Hence, an atmosphere at thirty-two degrees with its requisite supply of moisture, introduced into a confined space and heated up to eighty degrees, has its capacity for moisture so increased as to dry and wither everything with which it comes in contact: furniture cracks and warps, seams open in the molding, wainscoting, and doors; plants die; ophthalmia, catarrh, and bronchitis are common family complaints, and consumption is not infrequent. But this condition of house air is not peculiar to stove-heat. It is equally true of any overheated and confined atmosphere. The chief difference is, that warming the air by means of a close stove is more quickly accomplished and more easily kept up than by any other means. Sometimes, by the scorching of dust afloat in the atmosphere, an unpleasant odor is evolved which is erroneously supposed to be a special indication of impurity, caused by burning the air. It is an indication of excessive heat of the stove. But the air cannot be said to burn, in any true sense of the word, for it continues to possess its due proportion of elementary constituents. Such is the close stove and its dangers, under the most unfavorable circumstances. The Dutch stove is occasionally found in country railroad depots and similar places, where the frequent opening of doors makes amends for its deficiencies. In Russia, and other northern countries of Europe, stoves are frequently built of brick covered with porcelain, with relatively small fire-chambers near the bottom, and with winding smoke-flues which traverse many times through the structure, until nearly the whole of the heat generated is expended in it. The smoke-pipe, now comparatively cool, enters a flue in the wall and carries off the smoke only, while the heated mass of brick continues to retain heat and warm the room long after all the fuel is burned—for from eight to ten hours. If the same quantity of fuel were burned in an open fire grate or close stove, the heat therefrom would be expended in an hour.

Stoves have been so improved in recent years, in the United States especially, and are obtainable at such moderate expense, that no excuse for the continued use of such as have been above described now exists. Indeed, so important and rapid have been the improvements in the construction of stoves in the United States within the last eight or ten years, that it is difficult to find a market for those of older date. In England, where the people continue to be wedded to open grates, and where most is said by scientific persons against the use of stoves, improvements have been exceedingly slow and complicated, and the

practicability of maintaining a sufficient and equable temperature, and a wholesome atmosphere in a room warmed by a stove, is far from being realized; still less, the convenience of warming several rooms at the same time by the same means, hot-air furnaces scarcely being known.

The essentials for healthy stove-heat are a brick-lined fire-chamber, exhaust-flue for foul air, means for supplying moisture, and provision for fresh-air supply. A brick lining is requisite for the double purpose of preventing overheating, and for retaining heat in the stove. For the supply of moisture, the means are simple and easy of control, but often inadequate. An efficient foul-air shaft may be fitted to the commonest of close stoves by simply inclosing the smoke-pipe in a jacket—that is, in a pipe of two or three inches greater diameter. This should be braced round the smoke-pipe and left open at the end next the stove. At its entry into the chimney, or in its passage through the roof of a car, as the case may be, a perforated collar should separate it from the smoke-pipe. For stoves with a short horizontal smoke-pipe, passing through a fire-board, the latter should always be raised about three inches from the floor. A smoke-pipe thus jacketed, or fire-board so raised at the bottom, affords ample provision for the escape of foul air.

The introduction of fresh air is a comparatively easy matter, when by no more special provision, then by a strip of board under the window-sash, closely fitted. The lap of the sash at the middle admits the air with a direction to the ceiling, and, consequently, without draft on any one in the room.

The experiments of Pettenkoffer have shown that under the common conditions of the atmosphere, a very considerable exchange of gases takes place through dry plastered walls, brick, and stone. And it is the common experience of sick persons that they are sensitive to drafts through walls when the wind blows, and that they frequently take cold by exposure to the windy side of the house.

All flues for the exit of foul air should be perfectly smooth and tight. Rough surfaces not only retard but retain emanations which come in contact with them. Moreover, exhaust-flues should never be placed in outer cold walls, because the geatest density of the outer cold air prevents the ready ascent of the warmed and rarefied air from within. Another important consideration is the size of air-shafts. This can only be approximate, however, because the amount of air which will pass through a shaft depends in a great degree upon the relative temperatures of the inner and outer atmospheres, and the conditions of the weather, particularly the direction of the wind. As a practical average, the best observers recommend that the sectional area of both inlet and outlet shafts be twenty-four square inches per head; or, for buildings of three stories, one square inch for every fifty cubic feet of space; rooms below, one square inch for every fifty-five cubic feet; for ground floors, one square inch for every sixty cubic feet. It should be borne in mind that the friction in long flues considerably lessens the extractive power, and that the column of air in the flue increases in density as it ascends. In prisons, where the cubic space per head is compar-

atively small, the sectional area of the air-shafts should be at least twenty square inches per head.

Open fire-stoves combine the advantages of the open fire-place and the close stove, provide for fresh air, and economize heat. The important improvements in stoves of this kind have not only well-nigh supplanted the open fire-grate in supplying all that was ever claimed for it, but excel it in all the requisites of economy and comfort.

Hot-air furnaces are simply inclosed stoves placed outside the apartments to be warmed, and usually in cellars or basements of the buildings in which they are used. The manner of warming is virtually the same as by indirect steam-heat—by the passage of air over the surface of the heated furnace or steam-heated pipes, as the case may be, through flues or pipes provided with registers. The most essential condition of satisfactory warming by a hot-air furnace is a good chimney-draught, which should always be stronger than that of hot-air pipes through which the warmed air is conveyed into the rooms, and this can be measured by the force with which it passes through the registers. A chimney-draught thus regulated effectively removes all emanations; for, if the chimney-draught exceeds that of the hot-air pipes, all the gaseous emanations from the inside of the furnace, and if it have crevices, or is of cast-iron and overheated, all around it on the outside, will be drawn into the chimney. Closely connected with this requirement for the chimney-draught is the regulating apparatus for governing the combustion of fuel—the draught of the furnace. This should all be below the grate; there should be no dampers in the smoke-pipe or chimney, and all joints below and about the grate should be air-tight. The fire-pot should be lined with brick and entirely within the furnace, but separate from it, so that the fresh air to be warmed cannot come in contact with the fuel-chamber.

It should go without saying that the air which passes from furnaces into living-rooms should always be taken from out-of-doors, and be conveyed in perfectly clean air-tight shafts to and around the base of the furnace. Preferably, the inlet of the shaft, or cold-air box, should be carried down and curved at a level (of its upper surface) with the bottom, and full width of the furnace. Thus applied, the air is equally distributed for warming and ascent through the hot-air pipes to the apartments to be warmed. On the outside, the cold-air shaft should be turned up several feet from the surface of the ground, and its mouth protected from dust by an air-strainer. A simple but effectual way is to cover the mouth with wire cloth, and over this to lay a piece of loose cotton wadding. This may be kept in place with a weight made of a few crossings of heavy wire, and it should be changed every few months. And here, too, outside the house, should be placed the diaphragm for regulating the amount of coid-air supply, and not, as commonly, in the cellar.

As the best means of regulating the temperature and purity of the atmcsphere from hot-air furnaces, it is necessary to provide sufficiently large channels for both the inlet of fresh air and its distribution through the hot-air pipes. The area of the smallest part of the inlet (or inlets, for it is sometimes letter to have

more than one) should be about one-sixth of a square foot for every pound of coal estimated to be burned hourly, in cold weather, and to prevent, in a measure, the inconvenience of one hot-air pipe drawing from another, the collective area of the hot-air pipes should not be more than one-sixth greater than the area of the cold-air inlet. These proportions will admit the hot air at a temperature of about 120°, when at zero outside, and the velocity through the registers will not exceed five feet per second.

A large heating surface of the furnace is a well-recognized condition of both economy and efficiency. As a rule, there should be ten square feet of heating surface to every pound of coal consumed per hour, when in active combustion; and the grate area should be about one-fiftieth of that of the heating surface. For the deficiency of heat, or the failure of some of the hot-air pipes of hot-air furnaces in certain winds and weathers in large houses or especially exposed rooms, the best addendum is an open fire-grate. With this provision in northerly rooms, to be used occasionally, hot-air furnaces may be made to produce all the advantages of steam-heat in even the largest dwelling houses.

Steam-heat may well be compared with stove- and furnace-heat: stove-heat corresponds to direct radiation by steam, and furnace-heat to indirect. The supply of fresh air from the outside to and over the hot-air furnace, and through hot-air flues into the rooms through registers, is virtually the same as when it is conveyed by means of steam-heated flues in the walls. Exhaust flues, for getting rid of foul air, are equally essential. The stove, as representing direct radiation in the same manner as the steam coil, or plate, in the room, has the advantage over the latter of some exhaust of foul air, however little, even when the smoke-pipe is not jacketed, for the steam-heat has none. In comparison with open stove-heat, steam heat is at still greater disadvantage; for open stoves supply all the qualities of complete radiation—the introduction of fresh air and the escape of foul—to a degree wholly unattainable by steam-heat whether direct or indirect, or by hot-air furnaces, which always require special provision for the escape of foul air.

The advantage of stove and furnace heat over steam may be summed up thus: It is more economical, more uniform, more easy of management, more suitable for small areas to be warmed, and is free from the noises and dangers of steam. Irregularities of the fire in steam-heating are a constant source of inconvenience, and sometimes of danger. The going down of the fire during the night-time, or its neglect for a few hours at any time, is followed by condensation of the steam. On the addition of fuel and increase of heat, steam again flows quickly into the pipes where a partial vacuum has formed, and here, on coming in contact with the condensed water, it drives the water violently and creates such shocks as sometimes occasion explosions; or, at least, produces very disagreeable noises and general uneasiness, and frequently causes cracks and leaks. Hence direct steam heat, which for warming purposes alone is altogether superior to indirect, has been well-nigh abandoned. Indirect steam-heat places the leaks out of sight, but they commonly lead to mischief, and require special and expensive provision for access and repair.—*North American Review.*

INFECTIOUS DISEASES.

The Missouri State Board of Health recently issued a circular pertaining to the regulation of infectious diseases. The document requires physicians to report to the County Clerk all contagious cases within twelve hours after discovery. Doctors are obliged to report the death of patients from such complaints within twelve hours after death, and a failure to comply with this rule is made a misdemeanor. It is made the duty of the County Clerk to notify the State Board of Health of all such deaths that are reported to him, and he is authorized to place a yellow flag and placard on any dwelling where there is an infectious disease. An undue removal of such warnings is made punishable by fine. County Clerks are also given authority to isolate patients and employ nurses for their care, and have the power to compel the removal of persons afflicted with contagious diseases to such places as may be provided for their treatment by the County. They are likewise called upon to cause all persons in the immediate vicinity of a case of small pox to be vaccinated.

Parents or guardians who send children to school from an infected house are made liable equally with teachers who receive such scholars, and who are required to remove them from school. Failure to comply with any of these regulations is punishable by fine not exceeding $25.

METEOROLOGY.

THE CLIMATE OF KANSAS.

PROF. F. H. SNOW, OF THE STATE UNIVERSITY.

The climate of eastern Kansas is not the climate of western Kansas. Any discussion of this subject will be entirely inadequate, which fails to recognize the fact that Kansas is meteorologically divided into two distinct regions, separated from each other by an intermediate area, whose climate exhibits a gradual transition between the eastern and the western sections. The inclusion of two such widely differing regions in one civil commonwealth has its disadvantages as well as its advantages. The striking adaptability of western Kansas to sustain the immense cattle interests of that section adds an important element of prosperity to the State. But the fact that thousands of new comers from ignorance of the climate have attempted to introduce ordinary agricultural operations upon the so-called "plains" and have disastrously failed in the attempt, has placed an undeserved stigma upon the good name of Kansas in many far distant commu-

nities and has undoubtedly somewhat retarded immigration during the past few years. It is time for the general recognition of the fact that except in the exceedingly limited area where irrigation is possible, the western third of Kansas is beyond the limit of successful agriculture. Yet this portion of Kansas, upon the basis of one individual to each ten acres has the capacity to continuously sustain an aggregate of nearly 2,000,000 head of cattle. The last biennial report of the State Board of Agriculture represents the total number of cattle in the entire State as less than one and a half millions, which is considerably below the number which might be supported by the western third of the State alone.

The chief elements in a climate are temperature, rainfall, cloudiness, wind and humidity. The principal source of the information here presented upon these topics is the writer's personal observations for sixteen years at Lawrence, which, from its location, fairly represents the eastern third of Kansas.

The mean annual temperature is about 53.5°, which does not differ essentially from that of States to the east of Kansas in the same latitude. But from the annual mean temperatures alone no definite conception of a climate can be formed. The monthly means and the extremes of temperature determine the effect of the climate on human beings. The prominent advantage possessed by Kansas over many agricultural States consists largely in the length of the growing season, during which the monthly mean temperatures are sufficiently high to bring to full maturity a great diversity of crops, while the minimum temperatures are so high above the freezing point as to prevent all danger of damage from untimely frosts. The average date of the last severe frost of spring for the past sixteen years has been April 4th, while the average date of the first severe frost of Autumn has been October 19th, thus giving a period of over six months (198 days,) without frost enough to injure corn or wheat, or any other staple crop. During this period of sixteen years the latest severe spring frost was April 25, (in 1873,) and the earliest date of severe autumn frost was September 17, (in 1868). In the present year, (1883,) the latest severe spring frost occurred on March 29, and the earliest severe autumn frost was delayed until November 1, thus giving a period of more than seven months, (207 days,) of freedom from injurious frosts. Thus ample time has been afforded during each of the sixteen years for the thorough ripening and "hardening" of the corn crop. To this long period of immunity from frost Kansas owes her triumphant position at the present time, as the only one of the great grain-producing States which has raised first-class corn in 1883. This same peculiarity of Kansas climate has enabled our farmers to speedily retrieve their losses from the invasions of the Rocky Mountain locust—so-called "grasshoppers,"—now, happily a thing of the past.

In the spring and early summer of 1875, a large portion of eastern Kansas had been shorn as clean as a threshing floor, by the myriads upon myriads of young locusts. These devouring hosts took their departure the first and second weeks in June. Our courageous farmers, although many of them had already replanted their corn for the third and fourth time, made one more final and successful effort. Corn planted from the 15th of June to as late a date as the 15th

of July, yielded bountiful crops, the first severe frost of autumn occurring on the 30th of October—too late to damage the well ripened ears.

In their effect upon the population the summers of Kansas are far less oppressive and exhausting than might be inferred from their frequent length and high temperature. Of the sixteen summers which have come under our observation eight have been cool and eight have been hot. During this period the number of days on which the mercury reached or exceeded 90° has averaged 42 for each year, reaching a minimum of 20 in 1877 and a maximum of 68 in 1881. The cool summers are delightful, and there are important compensations by which the hot summers are rendered far more tolerable than those of States to the east of Kansas between the same parallels of latitude. Among these compensations are the very general coolness of the nights, no matter how hot the days may be; the unusual dryness of the atmosphere, which cools the surface of the body by a more rapid evaporation of the perspiration, and the almost constant brisk movement of the air, which rarely becomes calm.

The autumns of Kansas furnish the most enjoyable weather of the year, the mild Indian summer frequently continuing to nearly Christmas. During the present year (1883) building operations have been carried on without interruption up to the close of December.

The winters of Kansas have enough rigor to protect the population from the chronic languor too often engendered by a southern climate. Without the extreme severity which benumbs the faculties our winter temperature is sufficiently low to impart that healthful stimulus to mental and physical activity which seems essential to the highest development of the human race.

Of the sixteen winters whose records are before us, nine have been of moderate temperature, with mean between 26° and 32°; three have been severe, with mean below 25°, in one winter (of 1873–74) reaching 22.84°, and four have been exceedingly mild, with mean above 32°, in one winter (of 1877–78) reaching 39.54° The average number of days in each year on which the mercury has sunk below the zero point has been seven, the number varying from sixteen in 1872 to one in 1882. The winters generally break up in February, the first wild flowers often appearing before the end of that month. The lowest temperature during the sixteen years was 26° below zero; the highest was 108° above zero on August 5, 1874, giving an extreme range of 134°.

Kansas may be divided into three sections in reference to its rainfall. Eastern Kansas has an average annual precipitation of from thirty to thirty-five inches, according to the locality; central Kansas has from twenty to twenty-five inches while western Kansas has from ten to fifteen inches. In the first two sections the supply is ample to sustain a diversified agriculture, while in the third section it is altogether inadequate for agriculture, although sufficiently abundant to grow the grass for immense herds of cattle and sheep.

Wherever meteorological records have been kept for a long series of years, as at Ft. Leavenworth, Lawrence, Manhattan and Fort Riley, there is indisputable evidence that the effect of settlement has been to considerably increase the

amount of rain. This increase is slowly pushing westward the boundaries of the region of successful agriculture, but the increase cannot be beyond a certain moderate limit and cannot be expected to bring the western third of the State within these boundaries. The vapor by the condensation of which our Kansas rains are produced, comes chiefly from the waters of the Gulf of Mexico. The position of the body of water and the direction of the prevailing winds are such that but a small portion of the vapor can be brought to western Kansas.

A peculiar feature of the rainfall of Kansas consists in the fact that only about one-tenth of the annual precipitation occurs in the winter months. In the eastern States the amount of rain, including melted snow, is nearly as large in winter as in each of the other seasons. In Kansas, which has less rain in the winter than any State in the Union except Minnesota and Nebraska, the apparent deficiency is abundantly made good by a more copious supply of rain in spring, summer and autumn than is received by the great majority of the other States.

The distribution of rain through the months of the year is highly conducive to agricultural prosperity. Beginning with February, in which the average precipitation is reduced to its minimum, there is a constant increase in each month until June and July, when the rainfall reaches its maximum and begins to decline, each succeeding month showing a decrease in the average amount until the minimum is again reached in February. It is very rarely the case that the monthly rainfall during the growing season departs from the normal to such an extent as to seriously injure the staple crops. The only approach to a general drouth during the sixteen years of our observations was in 1874, when for several months in succession the rainfall fell considerably below the average amounts.

Kansas can truthfully claim to enjoy a larger amount of sunshine than the eastern States. The records show that the average cloudiness at Lawrence is a little more than 44 per cent. In the New England States the average is 53 per cent, in the southern States 47 per cent. In California the per cent is only 31, while in Great Britain it reaches 71, or nearly three-fourths of the sky.

The average direction of the winds in eastern Kansas is from the southwest. The average velocity of the wind at Lawrence is a little more than fifteen and a half miles an hour. This is sufficiently high to assist materially the proper ventilation of our houses and our clothing, but does not justify the common expression in other parts of the country that the Kansan lives in a continual gale. For the sake of comparison it may be mentioned that the average hourly velocity of the wind in Philadelphia is eleven, at Toronto nine miles; and at Liverpool thirteen miles. The greatest velocity recorded at Lawrence was at the rate of eighty miles per hour, from 3:34 to 3:45 A. M., April 18th, 1880. The average annual distance travelled by the wind at Lawrence is a little more than 138,000 miles. March and April are the two windiest months, the velocity rising to nearly twenty miles an hour. July and August are the two calmest months, the rate subsiding to less than twelve miles an hour.

The amount of moisture contained in the air is an important element of a

climate. Much has been said in reference to the dryness of the air in Kansas, and on account of this quality many invalids, especially those suffering from difficulties of the throat and lungs, have received permanent benefit from a residence in this State. During the period of our observations, the average relative humidity has been 68, complete saturation being represented by 100. By this it is meant that upon the average the air contained a little more than two-thirds of the amount of moisture it was capable of containing. This percentage of moisture forms a very desirable mean between the very moist and the very dry, being alike favorable to the healthful condition of man, the domestic animals and the growing crops.

For a more extended discussion of the climate of Kansas, accompanied by complete tables for each month and year, the reader is referred to an article by the writer in the Second Biennial Report of the Kansas State Board of Agriculture, from which article some statements have been reproduced here.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

TEMPERATURE OF THE AIR.	Jan. 20th to 30th.	Feb. 1st to 10th.	Feb. 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	—10.	-3.	-5.0	. .
Max	59.	68.	48.0	. .
Min. and Max	24.5	32.33	21.5	. .
Range	69.	71.	53.0	. .
TRI-DAILY OBSERVATIONS.				
7 a. m.	21 0	21.4	21 9	21.4
2 p. m.	39.3	34.9	29.1	34.1
9 p. m.	29.5	25.9	22.1	25.8
Mean	27.7	26.23	27.7	27.21
RELATIVE HUMIDITY.				
7 a. m.	91.0	90	. .	90 0
2 p. m.	59.0	74.5	87.6	75.3
9 p. m.	91.5	95.3	91.7	94.17
Mean	63.5	94.212	89.7	82.48
PRESSURE AS OBSERVED.				
7 a. m.	29.152	29.017	28.984	29.163
2 p. m.	29.228	28.183	28.473	27.123
9 p. m.	29.143	28.249	28.781	27.058
Mean	29.173	28.162	28.947	27.428
MILES PER HOUR OF WIND.				
7 a. m.	. .	. .	. .	. .
2 p. m.	. .	. .	. .	. .
9 p. m.	. .	. .	. .	. .
Total miles	3432	2391	1943	7766
CLOUDING BY TENTHS.				
7 a. m.	5.5	8.77	6.6	6.953
2 p. m.	4.4	8.37	5.7	6.183
9 p. m.	3.2	7.33	5.5	5.343
RAIN.				
Inches	0.25	1.95	0.93	1.043

In the period of this report, from January 20th to February 20th, snow fell on five (5) days, viz: January 26th, February 7th, 12th, 14th and 19th. On the night of the 12th during a storm of sleet and temperature below 20° F. a severe thunder-storm occurred. Although such storms are not unusual here in the winter months, the low temperature and severity makes this one worthy of note.

There were twelve days during the first two decades of February when cloudiness averaged more than 0.8. The 13th and 14th insts. were the coldest days, morning temperature −5° on the 13th.

On the 17th I saw a flock of ten robins. These birds and meadow-larks have been seen about here at intervals all this winter. There were a couple of days following the storm of sleet on the 12th when sleighs were out, but there has been no good sleighing here this winter.

STATE WEATHER BUREAUS.

We have many times had occasion to call attention to the value of a popular system of meteorological observations, particularly in those districts which are annually the scenes of terrible destruction dealt by tornadoes. The areas covered by these dreadful storms are so small that it is only by the closest observation that their development can be detected. We print elsewhere an outline of a system of "State Weather Services," proposed by the Chief Officer of the Signal Bureau at Washington, that commends itself to the attention of the Governors throughout the Union. The good results of a continuous record of atmospheric changes cannot be exaggerated, because there is not an industry in the country that would not derive some benefit therefrom. Not only would the cause of destructive storms be ascertained, but also the investigations as to the sources from which the different diseases dependent on atmospheric phenomena arise would be laid bare.

General Hazen, who since his appointment to the position of Chief Signal Officer, has made several changes in the service that cannot fail to call forth the approval of the public, now proposes a scheme which if developed, will prove of great benefit to every one. Over the broad expanse of territory lying between the Rocky Mountains and the Atlantic coast-line the Signal Service Bureau has about ninety stations, from which are sent to Washington three daily meteorological observations. By charting those reports the location and character of the areas of high and low pressure are discovered, and upon them depend the weather forecasts that are made every day at the central office. Owing to the small number of the stations they must be necessarily be very far apart; hence General Hazen's proposition, which is as follows: Each State in the Union should have an independent Weather Service for the purpose of gathering and utilizing local climatic data. By such a system the people would in time become conversant with physical conditions of every locality and be guided therehy. In the tornado

season, the results of observations in temperature and humidity would be inval uable, because they would enable a correct forecast of their development to be made.

The State Weather Service may be wholly volunteer and under the charge of a director or superintendent appointed by the governor, or it may be made a part of the duties of some officer now authorized by law, such as the surveyor-general, the superintendent of public instruction, the president of some State college, etc. The observer in each county may be a volunteer, or it may be made the part of the duty of some county officer to make a daily record and monthly report. Observations should be taken, if possible, in all State, county, and municipal offices and institutions, such as jails. asylums, hospitals, libraries, colleges, high-schools, and water-works, and by toll gate keepers, surveyors, canal-lock keepers, etc. The instruments used should, when practicable, be of uniform patterns, carefully tested before use by comparison with known standards, and should include at least one maximum and minimum thermometer, one dew-point or other hygrometer, and rain-guage, all which, with a supply of blanks and stamped envelopes for one year, need not cost more than $15 per station. The director should be fully impressed with the importance of the work and should issue each month a "review of the weather," as obtained from the State observations. this review to be furnished to each county paper for publication and to each observer within ten days after the close of the month. The Chief Signal Officer will furnish sample forms, instructions for taking observations, price-list of standard instruments, and give any information relative to this subject which the experience of the Signal Service may afford. Systems similar to the above are now in successful operation in Missouri and Iowa, and will soon be organized in Indiana, Kansas, Illinois, and Nebraska. When all the States east of the Rocky Mountains have their separate weather services, and those co-operate with the Washington Bureau, the resultant accumulation of meteorological data will be invaluable. For the benefit of our legislators a specimen "act" on the subject is given below:

An ACT to establish a central station of the Iowa Weather Service and for the appointment of a director thereof.—Laws 17, General Assembly, State of Iowa, chapter 45.

SECTION 1.—*Be it Enacted by the General Assembly of the State of Iowa,* That there be and hereby is established at Iowa City, a central station for the Iowa Weather Service, with Gustavus Hinrichs as director thereof, and in case of his death or disability his successor shall be appointed by the Governor.

SEC. 2.—The duties of said director shall be to establish volunteer weather stations throughout the State and supervise the same; to receive reports therefrom and reduce the same to tabular form, and report the same quarterly to the State printer for publication in the form of the Iowa Weather Reports.

SEC. 3.—That the State printer be authorized to print 2,000 copies of the said Iowa Weather Reports quarterly, 1,000 copies of which shall be distributed

by said director and 1,000 copies delivered to the Secretary of State, to be by him distributed in the same manner as other State documents.

SEC. 4.—That there is appropriated the sum of $1,000 annually, or so much thereof as may be necessary, for the purpose of meeting the actual expenses in carrying out the provisions of this measure; but no part of said sum shall be used in payment of salaries to any officer or officers, except for clerk hire and upon the order of said director.

SEC. 5.—This act, being deemed of immediate importance, shall take effect and be in force from and after its publication in the *Iowa State Leader* and the *Iowa State Register*, newspapers published at Des Moines, Iowa.—*N. Y. Herald.*

HISTORY.

ORIGIN OF THE KANSAS ACADEMY OF SCIENCE.

JOHN D. PARKER, U. S. A.

When I was called in April, 1867, to Lincoln College, Topeka, there was no scientific association in Kansas, and no general interest in science apparent in the State. The people of Kansas had suffered intensely in the border strife followed by the civil war, of which at Topeka, there were still evidences in the rifle-pits along the southern edge of the town, and in the palisades still standing at the intersection of Kansas Avenue and Sixth Street.

Prof. B. F. Mudge, of the Kansas Agricultural College, had published a report on the geology of the State, and another report had been published by Prof. G. C. Swallow, late of the University of Missouri; Prof. Frank H. Snow had recently been called to the University of Kansas. Major F. Hawn, of Leavenworth, was working on the meteorology of the State. These scientists and some others were pursuing various lines of scientific investigation, but there was no organization to bring them together to secure the results which flow from association.

Impressed with the necessity of some society to accomplish this purpose, I determined if possible, to organize a State scientific association. After agitating the matter for several months, and not meeting with any encouragement at Topeka, I wrote to Prof. B. F. Mudge, who replied that his heart was with me in the work, but he feared it was too early in the history of the State to organize such a society. Accepting an invitation to visit him during the long vacation, I spent three memorable weeks at his home in Manhattan, when we discussed very thoroughly, during our scientific rambles in the neighborhood, the subject of a State scientific association. Before my return Prof. Mudge had promised to go into the new movement.

Fortified with Prof. Mudge's indorsement and promised co-operation, I returned home, and set the matter before the people of the State through the public press. In due time I circulated and published a "call," which received the signatures of various scientists and public men in the State, to hold a meeting in my recitation room, in Lincoln College, September 1, 1868. A great storm occurred two days before the meeting which seemed likely to interfere with it, but Prof. Mudge came down the day before the meeting full of enthusiasm in the new movement, and the meeting was held at the appointed time with a very small attendance. At this meeting we organized the Kansas Natural History Society, of which Prof. Mudge was elected the first president, and I was elected secretary.

For two years Prof. Mudge and I struggled hard to keep the organization alive, for we had great solicitude in regard to its very existence. Public attention was often called through the public press to the importance of sustaining the new organization, and wherever we lectured in the State we always presented the claims of the Society.

The first annual meeting was held in the Presbyterian Church, at Topeka, but there was a very small attendance and little enthusiasm. It was in fact a very gloomy time with the Society. There was little or nothing in the treasury, and no one seemed to care for science. But Prof Mudge was full of faith in our final success, and said "we must not despise the day of small things." We agreed to go on notwithstanding the discouragements, and determined we would not say "fail" until we actually did fail. The officers were unanimously re-elected, for there was great unanimity in the early history of the Society, when two or three votes settled the whole matter. In those days we were not troubled with any minority reports, and it was usually unnecessary to put the negative of the question, for all had voted in the affirmative.

During the following year we worked faithfully in trying to establish the Society, but with very little encouragement from the public. Everybody was very busy about something else, and science was left to take care of itself.

At the end of two years we received an invitation from Prof. Snow, indorsed by the other Professors of the State University, to hold the annual meeting at Lawrence. We gladly accepted the invitation, and the meeting was so well attended, and such a desire expressed to enlarge the scope of the Society, that I moved resolutions, which were unanimously adopted, that the scope of the Society should be enlarged so as to include every line of scientific investigation and inquiry, and that the name should be changed from the Kansas Natural History Society to the Kansas Academy of Science. General John Fraser stated that papers were read at that meeting by Professors Mudge, Snow, Bardwell and others, which were worthy of any veteran society. The meeting was one of joyful interest on the part of those who had labored amidst so many discouragements, for we believed that the permanency of the organization was now fully assured. The growth of the Society has in fact outrun all our early anticipations, and from this time on the history of the Academy has been more generally known

to the people of Kansas. Lovers of science in almost every line of investigation have come forward and gladly carried on the work of the Academy, making original contributions in almost every department of science that have been known throughout the scientific world. But while we greet this ever increasing number of scientists, and give them all honor for their invaluable contributions to science, let us never forget the importance of the work wrought by Professors Mudge and Snow, in the early history of the Society.

The subsequent action of the Legislature in making the Society a State institution, and in giving it rooms in the Capitol building, was unsolicited, but it was a well deserved recognition by the State of the valuable but uncompensated services rendered to science by members of the Academy.

In this connection, I may be pardoned for saying, that the ultimate success attendant upon the organization of the Kansas Academy of Science, gave me encouragement, when I moved to Kansas City, to try and repeat the work there which I had been the humble instrument, with the assistance of others, in doing in Kansas. For seven years, I was permitted to work on, amidst the whirl of a large and growing city, in discouragement, and sometimes in financial embarrassment that almost paralyzed my efforts, in striving and assisting to lay the foundations of the Kansas City Academy of Science, whose interests are so intimately interwoven with those of the Kansas Academy of Science. Life has indeed been a hard struggle, and I have failed to realize many of my early ideals; but if the people if Kansas and Kansas City will continue to cherish these Academies so that they shall become a blessing to multitudes in coming years, and if these Academies will remember that they are closely related in origin, interest and work, and ever bear toward each other those fraternal relations which should characterize scientific brethren, I shall be recompensed beyond any expression of words.

BOOK NOTICES.

PROCEEDINGS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA: Octavo, pp. 128. Philadelphia, 1883.

This is Part II, June to October, 1883, and contains the results of much original investigation in different fields by such well known students of natural science as Professors Cope, Leidy, McCook, Heilprin, Meehan, Rand, and others. This society has been in active existence for nearly three-quarters of a century and has published many volumes of valuable transactions, etc. Its quarterly volumes of Proceedings are edited under the direction of the Publication Committee, by Dr. Edward J. Nolan, to whom all applications for them and all other publications of the Academy should be made.

THE COMEDY-BALLET OF GUEGUENCE: Edited by Daniel G. Brinton, A. M., M. D. Octavo, pp. 94; Philadelphia, 1883. Paper $2.00, cloth $2.50.

This is Volume III of Dr. Brinton's Library of Aboriginal Literature, the aim of which is to put within the reach of scholars authentic materials for the study of languages, history and culture of the native races of North and South America. It is a curious and unique work, being, as the editor states, the only specimen of the native American comedy known to him. It is composed in a mixed dialect, mixed low Spanish and corrupt Aztec, difficult of translation, and only valuable as exhibiting the peculiarities and characteristics of the natives, and giving the reader an idea of their humor, as well as of their colloquial language. The rendering of such pieces was, of course, accompanied with songs and dances. Although doubtless of recent origin, such pieces are not common nowadays, and as before stated, this is the only one ever published, as far as is known. It was obtained by the late Dr. C. H. Berendt, who prepared it by comparison of two manuscript copies in 1874.

The translation is preceded by an introduction by Dr. Brinton, in which the ethnology, the local dialects, musical instruments and dramatic exhibitions of Nicaragua are fully discussed. A map and numerous illustrations assist in making the text clear.

Several other volumes of this series are in preparation by noted ethnologists like Prof. A. S. Gatschet, A. F. Bandelier, Ernantez Xahila, and others, all of which will be edited by Dr. Brinton, and will possess rare interest to archæologists and other persons interested in American history.

TIMES OF CHARLES XII: By Z Topelius. 12mo., pp. 349. Jansen, McClurg & Co., Chicago, 1884. For sale by M. H. Dickinson, $1.25.

This is the third of the "Surgeon's Stories" announced by us last year, the first and second having been "The Times of Gustaf Adolf," and "Times of Battle and Rest." To these are to succeed three others of similar character, which are now in preparation. The author is Professor of History in the University of Finland, from whose original text these historical romances have been carefully translated.

The volume now before us gives, under the guise of a romance, a very graphic account of the life of Charles XII of Sweden, and the historical and social events of the period between about 1697 and 1718, a period filled with exciting events of a very important bearing upon the subsequent history of Europe. The story is well told and the translation in most respects does justice to the author. The accounts of the great military efforts and achievements of Charles and his generals in Germany, Russia, Norway, etc., are admirably woven about by the thread of the story, which involves the career of the hero Gustaf Adolf Bertelsköld, General Armfelt, Count Horn and other notable personages of the period.

The book has been put forth in very handsome style by the publishers and will doubtless prove a very successful venture.

EARLIER VICTORIAN AUTHORS: Edited by William Shepard. 12mo., pp. 288. G. P. Putnam's Sons, New York. For sale by M. H. Dickinson, $1.25.

Under the title of "The Literary Life" the Putnams are publishing a series of small handsome volumes, edited by Wm. Shepard, of which this is the third. It contains familiar and instructive sketches, anecdotes and personal recollections of such authors as Bulwer, Disraeli, Macaulay, Charlotte Bronté, Irving, Poe, and Harriet Martineau. The introduction, in which our former favorite, N. P. Willis, is freely quoted, is entitled "Literary London in 1835" and is one of the most interesting and entertaining chapters in the book. In it are presented in the gossiping, inimitable style of Willis, pen-pictures of Lady Blessington, Count D'Orsay, Lytton Bulwer, Grisi, Tom Moore and others of the brilliant literary ornaments of British society at their time. These sketches are irresistibly attractive, and no one can fail to finish them after once having commenced them.

TWENTY POEMS FROM LONGFELLOW: Illustrated; quarto, pp. 61. Houghton, Mifflin & Co., Boston, 1884. For sale by M. H. Dickinson, $4.00.

As a model of excellence and beauty in book-making, this volume closely approximates perfection in paper, printing and binding, while the engravings, which are taken from paintings executed by Mr. Ernest Longfellow, the poet's son, seem absolutely unsurpassable in beauty and delicacy of finish. They are the work of Geo. T. Andrew, W. B. Closson, W. J. Dana, E. and J. Clement, John Filmer, N. Orr and F. G. Putnam, and number just fifty. The frontispiece is a portrait of Longfellow, different from anything before published and hence less satisfactory than that to which we have been so long accustomed.

Among the poems selected for so elegant a fitting are: "It is Not Always May," "The Village Blacksmith," "Cadenabria Amalfi," "The Lighthouse," "Moonlight," "Three Friends of Mine," "Mad River in the White Mountains" "Becalmed," etc.

FAMOUS PAINTERS AND THEIR PICTURES: Harry W. French. 4to, pp. 203; fifty full-page illustrations. Lee & Shepard, Boston. For sale by M. H. Dickinson.

Under the title "Gems of Genius" there are collected in this volume copies of fifty of the best paintings of modern days, each accompanied by a page or two descriptive of the artist and his works. The object of the author is to gain from the works of great artists, by social familiarity with them and their masterpieces, instruction, enjoyment and inspiration, and with this in view he has selected his subjects from the most popular studios of Europe in the last generation.

The first and one of the noblest conceptions of all is Kaulbach's Genius of Painting; following this are the Dowie Dens o' Yarrow by Sir I. N. Paton. King Arthur and the Mystic Sword, by James Archer. A Dream of Ancient Venice, by J. C. Hooke, R. A. Death Coming as a Friend, by Rethel. De Block's Reading the Bible. Milton and Galileo in Prison, by Eyre Crowe. Edward Armitage's the Socialist. Buying the Wedding Gown, by Wm. Mulready. The Stirrup Cup, by Faed. The Arrest, by C. Claes. Launching the Life Boat, by T. Brooks, etc.

The object of the author is a worthy one and has been well executed in the selection of pieces as well as in the descriptive text. The publishers' work has also been well done.

ANIMAL AUTOMATISM AND OTHER ESSAYS: By Prof. T. H. Huxley. No. 53 of the "Library of Popular Science." Price, post-free, 15 cents. J. Fitzgerald, Publisher, 20 Lafayette Place, New York. For sale by Kansas City Book & News Co.

In this volume are contained five of the most instructive and interesting of Professor Huxley's later essays: namely, that on the hypothesis that animals are automata, and its history; that on Science and Culture; on elementary instruction in Physiology; on the border territory between Animals and the Vegetable Kingdom; and on Universities actual and ideal.

OTHER PUBLICATIONS RECEIVED.

Animal Automatism, and other essays, by Prof. T. H. Huxley, *Humboldt Library*, No. 53, 15c. Pilot Chart of the North Atlantic for February, 1884, from Commander J. R. Bartlett, U. S. Navy. Report of the Construction of the New Pension Building at Washington D. C., from J. V. Wurdeman. Abstract of an Account of Recent Archæological Excursions in Wisconsin and Ohio, by Prof. F. W. Putnam, from the American Antiquarian Society, October 22, 1883. Announcement of the Correspondence University for 1884. *English Illustrated Magazine*, MacMillan & Co., $1.50. *Ecce Montezuma*, Vol. 1, No. 1, January, 1884, 4to., Albuquerque, N. M., $3.00. Double-Star Observations, 1879–80, at Dearborn University, Chicago, by S. W. Burnham, M. A., reprinted from the Memoirs of the Royal Astronomical Society of England, by the Society, 1883. Bulletin de la Societe De Sciences Naturelles, De Neuchâtel, Tome XIII., La liste des ouvrages reçus, publiée á la fin du Bulletin, tiént lieu d' accusé dé reception. *Missouri School Journal*, Vol. 1, No. 10, 4to., 16 pp., semi-monthly, W. T. Carrington and J. L. Holloway, Editors, Jefferson City, Mo., $1.50. Circular No. 4, Bureau of Education, Recent School Law Decisions, Lyndon A. Smith, A. B., LL. M. *Psyche*, a Journal of Entomology, Vol. 4, December, 1883, Cambridge, Mass., $2.00. Plant-Analysis for descriptions of Plants, by

Geo. G. Groff, M. D., 8vo., pp. 100, Science Publishing Co., Lewisburgh, Pa., 30c. U. S. Consular Reports, No. 36, December, 1883.

SCIENTIFIC MISCELLANY.

RECENTLY PATENTED IMPROVEMENTS.

J. C. HIGDON, M. E., KANSAS CITY, MO.

AUTOMATIC CLOSER FOR ELECTRIC CIRCUITS.—This simple attachment for telegraph keys, etc., consists of a spring lever so arranged as to always keep the circuit closed when the instrument is not in use. The button-end of the lever rests, nominally, directly over the button of the key. The operator in the mere mechanical act of grasping the button of the instrument, presses down the button-end of the attachment, and so breaks the circuit that it may be rapidly closed and broken by means of the key, as is usual in telegraphing. This attachment has been perfected by Mr. S. J. Spurgeon, of Houstonia.

AUTOMATIC DAMPER FOR STOVES AND FURNACES.—Every one realizes the necessity and understands the operation of the common rotary damper, that is, it is presumed so, still for the benefit of those who may not understand that when a large stove is placed in a small room, the temperature must be regulated in some way. The usual method is to open or close the room-doors, or if the stove-pipe has a damper, to leave off whatever important subject you may be engaged with and to close this damper, then after again becoming absorbed, to be aroused and find the temperature of the room, probably, near zero, and the room full of smoke, then the fire is replenished after the damper is opened, and the whole operation is repeated.

These are the well-known characteristics of the hand-damper, and especially when it is used in connection with a soft-coal stove or a cooking-range. A damper has been recently patented, that has after a severe test of several months duration, not only overcome all of the disadvantages connected with the old hand-damper, but it has, by using wood or anthracite coal, cut down the quantity of fuel fully one-half.

The device is a very simple affair, and consists of a hollow circular cast- or sheet-iron chamber, having a pipe flange or collar upon each side. Now within this chamber, a damper is very nearly balanced, and it has a lever or handle attached to it, this lever extends outside of the damper-box, and upon it slides an adjustable balancing weight.

The weight may be set nearer to or further from the point of equilibrium, according to the temperature at which it is desired to hold the room. By a com-

parison, in principle, of this damper with an ordinary weighing-scales, its operation will be readily understood. When the draft becomes too strong, by reason of unduly rapid combustion, the damper is raised, and the draft stopped, then upon the fire resuming its normal temperature, the damper opens, and allows the products of combustion free egress, until the closing velocity is again reached. The name of the inventor cannot be mentioned at this point.

IMPROVEMENTS IN STEAM BOILERS.—Mr. W. R. Kirk, of this city, has recently patented a steam pressure-boiler, the design of which is to enable tubular boilers to be easily and thoroughly cleaned and repaired, and it consists in taking a shell of a boiler of the usual form, the ends of the said shell are open, and within each is secured a ring, one of which has an external diameter considerably less than that of the opposite end. Fitted against and secured to the inner face of the smaller ring, is a head-plate which has such diameter as to permit its insertion through the larger ring. This head is secured in place by means of threaded bolts. A second head is in a like manner, fitted upon the outer face of the larger ring, this head has such increase of diameter over the smaller head as to adapt it to the larger opening to be closed. The two heads may receive any desired number of tubes and they are secured at their ends within said heads, and they are preferably placed in position after the heads are bolted to place.

The joints between the heads and the rings are preferably formed by elastic gaskets, in order that they may be easily broken and reformed. When it is desired to cleanse or repair the boiler, the fastenings of the heads are removed, and the entire flue-section is withdrawn through the larger ring, after which each part of the boiler is easy of access and can be readily cleaned or repaired. There is also a very promising method of clearing the scales and sediment from fire-box boilers that has been patented by the same inventor, and to this end it consists, principally, in a steam-boiler composed of a shell and an enclosed fire-box which are separable and have their contiguous walls, secured in relative lateral position by means of sliding interlocking stay-bolts. There are provided at suitable points around the fire-box, rows of radial bolts or studs, the outer ends of these rows are united by means of a flat bar, thus causing it to form for each bolt, a "T"-shaped head. Secured upon the inner face of the fire box shell in a line, radially with each bar, is a bar that corresponds in transverse dimensions to like features of the first-mentioned bar, the grooves and bars are made slightly tapering lengthwise, so that when the fire-box is being placed in position the bars will move easily until near the limit of their motion, and then when the fire-box is in position within the shell, said bars will closely fit into the said grooves so as to not only hold the parts rigidly in position, but also to prevent dirt and sediment from entering. The separation of this fire-box from its shell requires but little time, and by its operations the boiler may be made to last for many years.

CIRCULAR TO COUNTY SURVEYORS IN KANSAS.

PROF. F. O. MARVIN, PROF. CIVIL ENGINEERING, UNIVERSITY OF KANSAS.

POLE STAR TIMES FOR 1884.

DATE.	Upper Culmination.		Western Elongation.		Lower Culmination.		Eastern Elongation.	
	H.	M.	H.	M.	H.	M.	H.	M.
Jan. 1	6	32.5 p m	12	35 5 a m	6	34.5 a m	12	33.5 p m
" 6	6	12.8 "	12	15.8 "	6	14.8 "	12	13 8 "
"11	5	53 1 "	11	52.1 p m	5	55.1 "	11	54.1 a m
"16 . . .	5	33.3 "	11	32.3 "	5	35.3 "	11	34.3 "
Apr. 1	12	33.7 "	6	32.7 "	12	35.7 "	6	34.7 "
" 6 . . .	12	14 0 "	6	13.0 "	12	16.0 "	6	15.0 "
"11 . . .	11	54.4 a m	5	53.4 "	11	52.4 p m	5	55.4 "
"16	11	34.9 "	5	33 9 "	11	32.9 "	5	35 9 "
July 1	6	36.8 "	12	35.8 "	6	34.8 "	12	37.8 "
" 6	6	17.2 "	12	16.2 "	6	15.2 "	12	16 2 "
"11	5	57.3 "	11	56.3 a m	5	55.3 "	11	54.3 p m
"16	5	38.2 "	11	37.2 "	5	36 2 "	11	35.2 "
Oct. 1	12	36.2 "	6	35.2 "	12	34.2 "	6	33.2 "
" 6	12	16 5 "	6	15 5 "	12	14 5 "	6	13.5 "
"11	11	52 9 p m	5	55 9 "	11	54.9 a m	5	53.9 "
"16	11	33 3 "	5	36.3 "	11	35.3 "	5	34.3 "

Use local time. Interpolate for intermediate days. Upper Culmination is the time of passing the meridian *above* the pole. Lower Culmination is the time of passing the Meridian *below* the pole. Eastern Elongation is the time when the star is farthest *East* of the pole. Western Elongation is the time when the star is farthest *West* of the pole.

Sine of Azimuth=sine of N. P. D. divided by the cosine of the latitude.

Pole Star's N. P. D. for January 1—16=1° 18′ 14″
April 1—16=1° 18′ 32″
July 1—16=1° 18′ 46″
October 1—16=1° 18′ 23″

SIR:—I would respectfully call your attention to chapter 25, sections 158 and 159 of the Laws of the State of Kansas, and suggest that compliance therewith on your part will further the cause of science and enhance the value of all Kansas land titles.

Any information that can be given from this department will be most cheerfully furnished.

OBITUARY NOTICES.

DEATH OF DR. GEORGE ENGLEMANN.

Dr. George Englemann died February 4th. He had been ill for nearly a year, suffering from Bright's disease, but his last severe illness was comparatively short, and though it was not expected he would survive, his friends were not expecting his death so soon. He had lived in St. Louis since 1835, and for the greater part of that time was a practicing physician, most successful and honored everywhere. But while he was successful as a doctor, his real claim for recognition lies in his scientific researches and discoveries. He was one of the most profound botanists in the country, and was the greatest authority in the world on the cactus. He made several excursions through the West, accompanied by Prof. Asa Gray, of Harvard University, whose reputation as a botanist is of the highest. Dr. Englemann's career as a botanist began shortly after he came to this country, when he was located near Belleville, Ill. He wrote a monograph in Latin upon the habits of a little creeper he found on a hazel bush. It was printed in Germany, and made quite a stir among scientists on account of the minuteness and perfection of the observations. He has fully equalled in later developments all that was expected of him then, and St. Louis has seldom lost a man so truly great. Largely to him is due the honor of having introduced the present method of classification of plants based on microscopical examinations and investigations. His whole heart was given to his work, and the results have been of great benefit to every portion of science to which he devoted his investigations.

Dr. Englemann was born either in Cruznet or Frankfort-on-the-Main. His father was a burgomaster in Frankfort, and was able to give his son a university education. He completed his studies in Germany, and came a young man to a new country.

The St. Louis Academy of Science met at the Washington University, upon the announcement of the death of Dr. Engelmann, and a motion was adopted that the members of the Academy attend the funeral in a body.

Dr. Englemann has been President of the Academy for six consecutive years, and prior to that time he had held the same position for several alternate years. About the last time he attended the Academy he presented a meteorological report of the condition of the weather for every day for forty-nine years, and also giving the mean temperature for each year. He announced that he had been endeavoring to discover some law governing the weather, but had failed to do so. A member of the Academy expressed the hope that the half-century would be completed, when Dr. Englemann replied that he had some misgivings on the subject, a presentiment that appears to have been well founded.

A called meeting of the Medico-Chirurgical Society was held at its hall, 2334 Washington Avenue, to take action on the death of the eminent Doctor, who was one of the early members of the Societv. Remarks on the eminent character of the deceased as a physician and man of science were made, after which the Society adjourned, proceeding to the residence, 3003 Locust Street, in a body, to attend the funeral services. Here, too, assembled the German Medical Society, the Academy of Science and the other bodies of which the Doctor was an honored member. A large number of citizens of other professions were present.

The funeral discourse was pronounced by Reverend Dr. Eliot, Chancellor of Washington University. He dwelt on the indefatigable character of the deceased and his labors in the cause of science. The best monument to his memory, he told his associates in the Academy of Science, would be to build that institution up as he would have had it builded.

The meeting of the St. Louis Academy of Science, held on Monday evening, February 19th, was devoted entirely to honoring the late brother member and was addressed at length by Professor Nipher and Mr. M. L. Gray, after which appropriate resolutions were passed, including one providing for the procuring of a bust portrait, full size, to be kept in the rooms of the Academy. The remarks made were very impressive, and would have been published in this number of the REVIEW if they had been received in time.

DEATH OF PROFESSOR GUYOT.

Prof. Arnold Guyot, Ph.D., died, on February 8th, at his home in Princeton, N. J., at the age of seventy-six years. This eminent geographer was born near Neufchâtel, Switzerland, September 28, 1807, and was educated there and at Stuttgart and Carlsruhe, in which latter place he formed an intimate acquaintance with Louis Agassiz, and with him began the study of natural science, and they together investigated the glaciers of the Alps. Guyot studied theology for three years at Neufchâtel and at Berlin: but being deeply interested in scientific studies, he abandoned his preparation for the ministry and devoted himself to physics, meteorology, chemistry, mineralogy, zoölogy, and botany.

In 1835 he went to Paris, where he resided for five years, passing his winters in study, and the summers in scientific excursions in France, Belgium, Holland, and Italy. He made a tour in 1838 in Switzerland, and first discovered the laminated structure of the ice in glaciers, the motion of the central portion being more rapid than that of the borders, as in streams of water. He showed that the motion of the glacier is due to the displacement of its molecules. These important discoveries were fully confirmed and illustrated by the investigation of Agassiz, Fobes, and others, several years afterward. For seven years he explored the Alps in Switzerland and Italy, to determine the distribution of erratic boulders and the mode of their transportation. He explored a tract three hun-

dred miles long and two hundred miles wide, and delineated eleven different regions of rocks, made over three thousand barometrical observations, and tracked the characteristic species of rock of each basin to their source. These investigations were to have been recorded in the second volume of the "Systéme Glaciaire" by Agassiz, Guyot, and Desor, but the breaking up of the University of Neufchâtəl (where Guyot was professor) by the Revolutionary movements of 1848 prevented this project, and they were never published. A topographical map of the subaqueous basin of the lake of Neufchâtel was prepared by him, the first of the kind ever published.

He was Professor of History and Physical Geography in the Academy of Neufchâtel from 1839 to 1848, when he left Europe and came over to America, soon after Agassiz, and by his persuasion took up his abode in Cambridge and drew immediate attention by a series of lectures deliveered in Boston in 1848–9, which Professor Felton translated for a newspaper. They were afterward published as a book, with the title "Earth and Man," which is still a popular work. Professor Guyot is best known in this country by his series of school geographies, which, appearing between 1866 and 1873, came into wide and general use in schools, and took rank at the head of geographic text-books. Guyot was elected Professor of Physical Geography at Princeton College in 1855, and subsequently Professor of Geology, and he has remained there ever since, being the senior professor of the College. He was the first to determine the true height of Mt. Washington in 1851, of the Black Mountains of North Carolina in 1856, and of the Green Mountains of Vermont in 1857. His contributions to science have been numerous and valuable.—*Journal of Education.*

EDITORIAL NOTES.

IN view of the terrible floods in the Ohio River again this year, public attention is being given to devising means to prevent their re-occurrence. In this connection we invite a re-reading of the suggestions of Rev. Albert E. Wells, of this city, in his article upon "Freshets and Overflows" in the August, 1883, number of the REVIEW.

IN the report on the Production of Swine in the United States, by Mr. Joseph Nimmo, a history of trichina is given, showing that it existed in Europe before the importation of American pork, and communications from the health officers of large cities, and other experts, are printed in support of the assertion that the danger arising from the consumption of pork is infinitesimal. In conclusion, tables are given showing the value of merchandise imported in this country from Germany and France.

THE German sanitary commission, which was sent out to Egypt by the imperial board of health to study the nature, causes, etc., of cholera, has discovered the cholera germ in a water tank at Calcutta, and found in the suburban village, where the cholera made its appearance, the same microscopic organism which has been discovered in the lower intestines of the cholera victims of Egypt.

THE French Academy of Medicine has, with one dissentient voice, pronounced in favor of a repeal of the prohibition of the importation of American pork.

THE tornado that swept over Alabama, Georgia, South Carolina, and North Carolina, last month, was without a parallel in this country, so far as the destruction of life is concerned. In Georgia, where its greatest fury was spent, it is reported that over three hundred men, women, and children were killed outright.

CONGRESSMAN DOCKERY, of this State, has introduced a bill providing for the appropriation of $12,000 for the maintenance of such additional signal stations as may be necessary to secure reports in regard to threatened dangers on account of floods. Should the proposed bill become a law, the people located on the great rivers and their tributaries will be forewarned of danger in ample time to take all possible measures for the safety of life and the preservation of property. From the results of such observations and reports in the past, there is no doubt that the work of the Signal Service could be made of increased value to the people by the methods proposed.

THE laying of the telegraph wires in Washington City underground has proved so successful that when tested by the reflecting galvanometer the insulation has been found perfect.

THE Salina Normal University, of Salina, Kansas, will be ready for the reception of students, September 2, 1884. The University building, now under construction, will be a large, commodious structure, ample for the accommodation of sixty to seventy-five students in its dormitory wing, and of five hundred to six hundred in the college wing. The Institution will be Normal, Scientific, Philosophical, and Classical, and its various courses of study are prepared carefully on that basis.

MR. F. H. FRANKENBERG, of Pueblo, Colorado, is about to utilize the raw soda found in the alkaline lakes of Wyoming Territory, by purifying it and converting it, at Pueblo, into caustic soda, concentrated lye, baking-soda, etc. It is believed that the cheapness and abundance of the material will enable him to manufacture these products on a profitable scale, and possibly glass also.

IN recognition of the good feeling of this Government in purchasing of its salvors the barque "Resolute," abandoned in the Arctic seas by Sir Edward Belcher, May 15, 1854, and restoring it to the British Government in December, 1856, that Government has just presented to the United States the steamer "Alert" to be used in the expedition for the relief of the Greely party early in this year.

THE Kansas Academy of Science has sesected Prof. H. E. Sadler, of the Normal School, at Emporia, to prepare a paper for the next annual meeting on the subject of chemistry, and Prof. Frank Kizer, of the city schools, on ichthyology.

WE have received the January number of the Kansas City REVIEW OF SCIENCE AND INDUSTRY, and find in it many articles valuable not only to the scientist but also to students and teachers, who, if they are at all interested in the scientific progress of the day, cannot afford to be without the REVIEW, which is one of the best journals of its kind published in the country.—*Western Normal Aavocate.*

THE death of Prof. Arnold Guyot, the distinguished scientist, removes a man who, next to Agassiz, was probably the most learned and useful physicist that we have ever had in this country.

IT seems a little singular that most of the scientific journals of the day have announced that the death of General Humphrey occurred November 28th instead of December 27, 1883, the latter being the correct date.

THE remains of Lieutenant DeLong and party arrived at New York on the afternoon of February 20th, and have since been interred with due honors.

PROF. PAUL SCHWEITZER, of the State University of Missouri, writes as follows on February 11th: "I enclose postal order for $5 00 for two years subscription to the REVIEW. Pardon he delay, which was partially caused by my late absence in Europe, and receive my appreciation of your efforts in maintaining a readable and interesting scientific journal."

WOLGEMUTH, the conductor of the Australian Expedition, has told some of the results of his work at a late meeting of the Vienna Geographical Society. He observed 124 auroras, about ten of which were crown-shaped. Among the old lava streams and in the crevices of the old and numerous craters of the island of Jan Mayen he discovered traces of a still progressing volcanic activity, and three times observed well-marked subterranean shocks.

A prize of $2,400 has been awarded by the Turin Academy of Sciences to Mr. Hormuzd Rassam for his discoveries in the field of Assyrian and Babylonian antiquities.

PROF. H. S. PRITCHETT, of the Washington University, St. Louis, on last Monday night, February 25, delivered a lecture on his trip to New Zealand last year with the Transit-of-Venus expedition. The account was pretty much the same as that from his pen published in the February REVIEW, but was illustrated with numerous views. Memorial Hall was filled and the audience was well entertained.

THE suit against General Di Cesnola for alleged frauds in the Cypriote antiquities sold by him to the New York Museum of Arts has resulted in his vindication, which is a source of congratulation, not only for himself, but also for the museum.

ITEMS FROM PERIODICALS.

Subscribers to the REVIEW *can be furnished through this office with all the best magazines of the Country and Europe, at a discount of from 15 to 20 per cent off the retail price.*

A mass convention of American inventors will be held in Cincinnati, beginning March 25, 1884, in the Great Music Hall and Exposition Building of that city. There is a universal feeling among inventors that something must be done to protect their interests, and the convention to be held will seek to adopt some united form of action, and form state associations. All inventors and patentees are interested in this movement, and all who can attend, and desire to do so, should at once address the chairman of the executive committee, J S. Zebe, editor of the *American Inventor*, 188 West Fifth street, Cincinnati, Ohio.

THE opening paper in the *Magazine of American History* for February, by George Cary Eggleston, is a most effective piece of word-painting, the subject being "Our First Ten Presidents" Dr. Cyrus Thomas, the learned antiquarian, follows with an exceptionally readable essay on the "Houses of the Mound-Builders." Minor Topics contains a stirring letter from Lyon Gardiner Tyler, of Richmond, Va., concerning President relation to the Oregon Question; also a vivid description of "Some of the Cavalry Fights of the Comanches." The departments of Notes, Queries, Replies, Societies, and Book Notices are remarkably well sustained. This number of the *Magazine* is notably strong in all its varied and important features.

OUR former fellow citizen, J. E. Caven, is now publishing the *Popular Monthly* in Chicago, a magazine devoted to first-class literature only. We have received the February number and find its contents able, entertaining, and varied and its appearance attractive. Price $1 50; clubbed with the REVIEW, $3.00.

THE *Globe-Democrat* says: The recent terrible coal-mine accident in Colorado, has directed attention to the necessity that exists in other states, for better laws and closer surveillance in the matter of mining operations. There is a general neglect in this respect, and no state, perhaps, does what it should to protect the lives of men engaged in mining. No law and no care can make mining entirely safe, of course, but improved systems of inspection and certain punishment for violations of fixed rules as to ventilation, etc., would, no doubt, lessen the number of accidents.

THE *North American Review*, now in its 69th year, maintains its high standing among thinking people by presenting able and reliable articles from the best informed writers of the day upon literary, political and scientific subjects. We copy a portion of Dr. A. N. Bell's article in the February number, upon "Stove and Furnace Heating," being his views of the subject in a discussion of the merits of the heating question between himself and Prof. Trowbridge. Among the most interesting in the March number are: "Is Our Civilization Perishable?" by Judge J. A. Jameson, who considers the several agencies by which the overthrow of the existing civilization might be effected. "A Defenceless Sea-Board," by General H. A. Smalley, is a description of the unprotected condition of the harbors and coast cities of the United States; and though the author employs none of the arts of the rhetorician, his statement cannot fail to awaken the people of this country to the importance of being in peace prepared for war. Other articles are "Literary Resurrectionists," by Charles T. Congdon; "How to Improve the Mississippi," by Robert S. Taylor; and "The Constitutionality of Repudiation," by D. H. Chamberlain and John S. Wise. $5.00; clubbed with the REVIEW, $6.50.

THE *Ausland*, a German weekly magazine of Geography, Ethnography, and Anthropology, published at Munich, has just entered upon its fifty-seventh year, and bids fair to outrun all its modern competitors in usefulness and erudition. In the first number of 1884, the able editor, Prof. Friedrich Ratzel, presents his readers with sketches on the distribution of marine algæ, on Malayan mythology, on Russian ethnology, on Waganda and Wanyoro commerce, on auriferous deposits of Atrato River (Isthmus of Panama), and on Homeric geography. To this is added the most recent correspondence obtained by him from African and Asiatic explorers, written from their fields of research.

IN the *Popular Science Monthly* for March we find, as always, many good things, such as "From Moner to Man," by Frances Emily White, M. D.; "Green Suns and Red Suns," by W. H. Larrabee; "Mexico and Its Antiquities," (Illustrated); "Fashion and Deformity in the Feet," by Ada H. Kepley, (Illustrated); "Science *vs.* the Classics," by Prof. C. A. Eggert; "The Chemistry of Cookery," by W. Mattieu Williams, etc., etc. The editorial notes and literary notes are always an attractive feature in this valuable magazine. D. Appleton & Co., $5.00: clubbed with the REVIEW, $6.50.

THE March *Atlantic* presents its usual excellent array of good articles, among which we note the continuation of S. Weir Mitchell's interesting story, "In War Time;" "The Discovery of Peruvian Bark," by Henry M. Lyman; "Don John of Austria," by Alexander Young; "The Girdle of Friendship," by Oliver Wendell Holmes; "The Sources of Early Israelitish History," by Philip H. Wicksteed; "English Folk Lore and London Humors," "The Contributor's Club," etc. Houghton, Mifflin & Co.; $4.00, clubbed with the REVIEW, $5.50.

To any person remitting to us the annual subscription price of any three of the prominent literary or scientific magazines of the United States, we will promptly furnish the same, and the KANSAS CITY REVIEW, *besides, without additional cost, for one year.*

THE *Art Interchange*, of February 14th, contains a beautiful design in color—"The Butterfly Fairy." Other attractive illustrations are six designs for a fish set. These are both beautiful and unique. A crab-apple design for a panel, and another, from the Royal School of Art Needlework, at South Kensington, for sketching on linen, are both to be commended. A charming woodland scene is given as a suggestion for crayon work, and another (an artistic marine) as a study for pen-and ink sketch. In the "Notes and Queries" department, house-decoration, oil, mineral, and water-color painting, brass hammering, and kindred art topics are intelligently discussed.

THE March *Harper's Monthly* contains an illustrated article on "St. Louis," that possesses much local interest to western readers; "Hints on Domestic Decoration," by Alexander F. Oakey, well illustrated by the author; "The Drainage of the Ever-Glades," with ten maps, by W. Wallace Harney, besides many other sketches, stories, poems, etc , all illustrated in the most arti tic manner. $4.00; clubbed with the REVIEW, $5.30.

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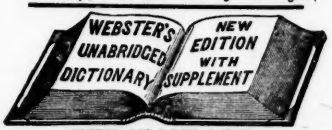

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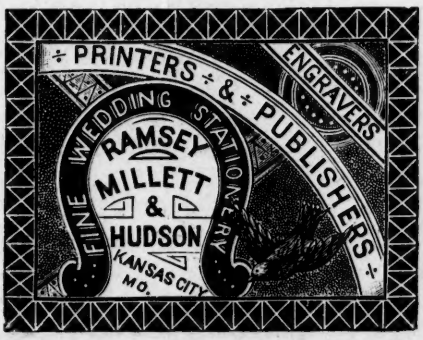

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